ODICAL Denmark. Dan. Fisk. Hav.
0, no.6 Medd. Serie: Fisk.
LIBRARY
FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS

MEDDELELSER

FRA

KOMMISSIONEN FOR DANMARKS FISKERI- OG HAVUNDERSØGELSER

SERIE: FISKERI · BIND X

NR. 6. C. V. OTTERSTRØM: 125 SALMON FROM WEST JUTLAND

KØBENHAVN
C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI A/S, KBHVN.
1938

MEDDELELSER FRA KOMMISSIONEN FOR HAVUNDERSØGELSER

Serie: Fiskeri.

Bind I.

Nr. 1 C. G. Joh. Petersen: On the larval and postlarval stages of the long Rough Dab and the Genus Pleuronectes. 2 Plates. 1904. 13 p. Kr. 1.00.

» 2 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. I. 12 Plates. 1905. 70 p. Kr. 5.25.

» 3 Johs. Schmidt: On pelagic post-larval Halibut. (Hippoglossus vulgaris Flem. and H. hippoglossoïdes Walb.) 1 Plate. 1904. 13. p. Kr. 0.75.

» 4 Johs. Schmidt: De atlantiske Torskearters (Gadus-Slægtens) pelagiske Yngel i de postlarvale Stadier. Med 3 Tavler og 16 Figurer. 1905. 74 S. Kr. 3.00.

» 4 Johs. Schmidt: The pelagic post-larval stages of the Atlantic Species of Gadus. A Monograph with 3 Plates and 16 Figures in the Text. 1905. 77 p. Kr. 3.00.

» 5 C. G. Joh. Petersen: Larval Eels (Leptocephalus brevirostris) of the Atlantic coasts of Europe. 1905. 5 p.

» 6 A. C. Johansen: Remarks on the life history of the young post-larval Eel (Anguilla vulgaris Turt.) 1904. 9 p. Kr. 0.50.

» 7 Adolf Sev. Jensen: On fish-otoliths in the bottom-deposits of the Sea. I. Otoliths of the Gadus-Species deposited in the Polar Deep. 4 Fig. 1905. 14 p. Kr. 0.50.

» 8 Johs. Schmidt: On the larval and post-larval stages of the Torsk (Brosmius brosme [Ascan.]) 1 Plate. 1905. 12 p. Kr. 0.75.

Bind II.

» 1 C. G. Joh. Petersen: On the larval and post-larval stages of some Pleuronectidæ (Pleuronectes, Zeugopterus.) 1 Pl. 1906. 10 p. Kr. 0.50.

» 2 Johs. Schmidt: The pelagic post-larval stages of the Atlantic species of Gadus. A monograph. Part II. 1 Pl. 1906. 20 p. Kr. 1.00.

» 3 Johs. Schmidt: On the pelagic post-larval stages of the Lings (Molva molva [Linné] and Molva byrkelange [Walbaum]). With 1 Pl. and 3 Figures. 1906. 16 p. Kr. 0.75.

» 4 Johs. Schmidt: On the larval and post-larval development of the Argentines (Argentina silus [Ascan.] and Argentina sphyræna [Linné]) with some Notes on Mallotus villosus [O. F. Müller]. 2 Pl. 1906. 20 p. Kr. 1.50.

» 5 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. II. The marking and transplantation experiments with Plaice in the years 1903—06. 9 Pl. and 10 Figures. 1907. 122 p. Kr. 5.25.

» 6 Johs. Schmidt: Marking experiments on Plaice and Cod in Icelandic waters. 2 Charts. 23 p.

» 7 Johs. Schmidt: On the post-larval development of the Hake (Merluccius vulgaris Flem.) 1 Pl. 4 Figures. 1907. 10 p. Kr. 1.75.

» 8 Johs. Schmidt: On the post-larval development of some North Atlantic Gadoids (Raniceps raninus [Linné] and Molva elongata [Risso]). 1 Pl. and 1 Fig. 1907. 14 p. Kr. 0.75.

» 9 Johs. Schmidt: On the post-larval stages of the John Dory (Zeus Faber L.) and some other Acanthopterygian Fishes. 1 Plate. 1908. 12 p. Kr. 0.75.

Bind III.

» 1 C. G. Joh. Petersen: On the larval and post-larval stages of some Pleuronectidæ (Zeugopterus, Arnoglossus, Solea.) 2 Plates. 1909. 18 p. Kr. 1.25.

» 2 J. P. Jacobsen and A. C. Johansen: Remarks on the changes in specific gravity of pelagic fish eggs and the transportation of same in Danish waters. 2 Figures. 1908. 24 p. Kr. 0.75.

» 3 Johs. Schmidt: Remarks on the metamorphosis and distribution of the larvae of the Eel (Anguilla vulgaris Turt.). 1 Pl. and 1 Chart. 1909. 17 p. Kr. 1.00.

Nr. 4 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. III. On the variation in frequency of young Plaice in Danish waters in 1902—07. 12 Figures. 1908. 48 p. Kr. 1.50.

» 5 A. C. Johansen: Do. do. do. IV. Is the Plaice indigenous to the true Baltic? 2 Fig. 1908. 23 p. Kr. 0.75.

» 6 Johs. Schmidt: On the occurrence of Leptocephali (Larval Muraenoids) in the Atlantic W. of Europe. 2 Pl. & 1 Chart. 1909. 19 p. Kr. 1.50.

» 7 Johs. Schmidt: On the distribution of the fresh-water Eels (Anguilla) throughout the world. I. Atlantic Ocean and adjacent regions. A bio-geographical investigations. 1 Chart. 1909. 45 p. Kr. 1.75.

» 8 A. C. Johansen: Bericht über die dänischen Untersuchungen über die Schollenfischerei und den Schollenbestand in der östlichen Nordsee, dem Skagerak und dem nördlichen Kattegat. Mit 10 Figuren im Text. 1910. 142 S. Kr. 4.50.

Bind IV.

» 1 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. V. The supposed migrations of plaice from the Kattegat and Belt Sea to the true Baltic. 5 Figures. 1912. 34 p. Kr. 1.25.

» 2 Johs. Schmidt: On the identification of Muraenoid larvae in their early (»Preleptocephaline«) stages. 1 Plate. 1913. 14 p. Kr. 0.75.

» 3 A. C. Strubberg: The metamorphosis of elvers as influenced by outward conditions Some experiments. 1913. 11 p. Kr. 0. 50.

» 4 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. VI. On the immigration of plaice to the coastal grounds and fiords on the west coast of Jutland. 1913. 26 p. Kr. 1.00.

» 5 P. L. Kramp: Report on the fish eggs and larvæ collected by the Danish research steamer »Thor« in the Langelandsbelt in 1909. With 6 Figures in the text. 1913. 39 p. Kr. 1.25.

» 6 Bjarni Sæmundsson: Continued marking experiments on plaice and cod in Icelandic waters. 7 Fig. 1913. 35 p. Kr. 1.25.

» 7 Johs. Schmidt: On the classification of the freshwater Eels (Anguilla). 1915. 19 p. Kr. 0.75.

» 8 Ö. Winge: On the value of the rings in the scales of the Cod as a means of age determination. Illustrated by marking experiments. 1916. 21 p. Kr. 0.75.

» 9 A. C. Johansen: Contributions to the biology of the Plaice with speciel regard to the Danish Plaice-Fishery. VII. Marking experiments with plaice in the North Sea off the west coast of Jutland during the years 1906—1912. With supplementary observations on the previous Danish experiments. 27 Fig. 1915. 60 p. Kr. 2.00.

Bind V.

» 1 Johs. Schmidt: Marking experiments with Turtles in the Danish West Indies. With 5 Tables and 11 Fig. 1916. 26 p. Kr. 1.00.

» 2 A. C. Strubberg: Marking Experiments with cod at the Færoes. 24 Fig. 1916. 126 p. Kr. 4.00.

» 3 A. C. Johansen: Marking Experiments with Sole (Solea vulgaris Quensel) and Turbot (Rhombus maximus L.) in the Kattegat and Baltic Waters: 4 Fig. 1916. 18 p. Kr. 0.50.

» 4 Johs. Schmidt: On the early larval stages of the Fresh-Water Eels (Anguilla) and some other North Atlantic Murænoids. 4 Plates and 14 Fig. 1916. 20 p. Kr. 175.

» 5 P. Jespersen: Contributions to the Life-History of the North Atlantic Halibut (Hippoglossus vulgaris Flem.) 1 Plate and 16 Fig. 1917. 32 p. Kr. 1.50.

MEDDELELSER FRA KOMMISSIONEN
FOR DANMARKS FISKERI- OG HAVUNDERSØGELSER

SERIE: FISKERI · BIND X · NR. 6 · 1938

125 SALMON FROM WEST JUTLAND

BY

C. V. OTTERSTRØM

KØBENHAVN
C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI A/S, KBHVN.
1938

CONTENTS

Page

Origin of the material 3
Are there one or several stocks of salmon in West Jutland? 3
The migrations of the salmon in the North Sea 3
The liberations of marked salmon in West Jutland 4
Examination of the material 4
- Duration of the stay of the young salmon in fresh water 5
- The "Fjord-Zone" in the scales 5
- The growth of the salmon 6
- Duration of the stay in the sea before first ascent 7
- Comparison with the growth of other stocks 7
- Length and weight of the ascending fish 8
- The time of ascent 9
- The coefficient of nutrition 9
- How many salmon are previously spawned fish? 10
- Should the kelt be protected? 11
- Is there a regular variation of the catches? 11
- Which streams of West Jutland are salmon waters? 14
- The annual amount of ascending individuals 14
- Comparisons with other stocks of salmon 15

Survey 15
Tables 16
Dansk Résumé (Danish Summary) 21
Literature 26

For some years various anglers have sent to the Danish Biological Station scale samples of salmon caught by themselves or other persons in the Skjern Aa; such samples were also taken from salmon caught in nets in the River Storaa during the close season for the purpose of providing fertilized eggs for hatching, and from some few fish from the Varde Aa and the Sneum Aa. When counted the samples amounted to a total of 129, but 4 of these had to be rejected because they consisted of one scale only or of nothing but substitutional scales. Out of the rest 107 originate from the Skjern Aa, 16 from the Storaa, 1 from the Varde Aa, and 1 from the Sneum Aa. Although the material is not by far so large as one would desire, there seems to be reasons for its publication inasmuch as no satisfactory analysis of the salmon of West Jutland is at hand[1]) and it would be interesting to see whether these salmon show any characteristics of their own.

There is a possibility that a well-defined stock of salmon does not at all exist in West Jutland, neither in the individual salmon rivers nor in all the streams as a whole. The question was discussed in the "Ferskvandsfiskeribladet", and Chr. Løfting (14), who initiated the discussion, inclined to think that many of the salmon of West Jutland were stray individuals that properly belonged to foreign (for instance Norwegian) stocks. Løfting rested this view on the following points: 1° the catches of trout in West Jutland seem to have been rapidly decreasing whereas the catches of salmon seem to maintain their level; 2° in West Jutland are caught few (if any) of the small ascending salmon (Group A) that made up a large portion of the catches for instance in the River Gudenaa.

It seems to be certain, however, that a spawning of salmon takes place in the watercourses of West Jutland though apparently to a somewhat limited extent. Likewise, it must be supposed that some of the young salmon reach the sea in spite of the dangers impending chiefly in the form of irrigation canals and eel-pots (in the streams and particularly in the fjords). Even if part of the salmon originate from foreign stocks, the possibility would consequently exist that another part of these fish consist of salmon that have been hatched in the rivers of West Jutland.

An analysis of the 125 scale samples might possibly throw some light on the question whether all the salmon of West Jutland are of foreign descent or originate from these localities, or the body of ascending fish is composed of different elements.

Our knowledge of the migrations of the salmon in the North Sea is extremely limited. Järvi, Alm, Willer, and others have given us an understanding of the curious migrations of the salmon in the Baltic, but we do not as yet know anything about the question whether a

[1]) H. Blegvad (3) gives a table showing the age etc. of 46 of the salmon from the Skjern Aa mentioned here and basing on my readings of the scale samples; however, my increased experience in this matter has now caused me to read some of these samples in a different way.

corresponding circulation takes place in the North Sea—whether for instance the young salmon of West Jutland after their descent to the sea go down to the coastal waters of Friesland. One might think so and might further consider it possible that some young Norwegian salmon went the same way, but this would again mean (and this is not the case) that we might expect a fishing for "small salmon" ("Mielnica", i.e. fish during their first year of sea life) to have developed in the southern North Sea in the course of years as is the case at Bornholm and the coast of Pomerania. There are apparently few or no "small salmon" in the southern North Sea whereas they have been taken in one of the fjords of Norway, in mackerel nets in the Skagerak, and some few specimens also at Scotland. Possibly the young salmon of West Jutland go in a northerly direction; the Norwegian marking experiments (6, 7) say nothing about this, which, however, may be due to the possibility that none of the few salmon of Danish origin came to be marked in Norway. And possibly the young salmon do not even migrate very far. It is to be hoped that the liberations of marked salmon fingerlings in the rivers Storaa, Skjern Aa and Kongeaa will gradually yield some information on this matter.

The extent of the markings carried out during recent years (from 1927) is rather considerable; the following marked salmon were liberated in West Jutland (21): 1° 21 stripped spawners marked with safety-pins; 2° 51 5-year-old pond salmon from Spjarup, most of which had been marked with safety-pins, the rest with double buttons; 3° 712 1- and 2-year-old pond salmon from Spjarup and 203 smolt, some of them marked as described above, most of them, however, with a silver wire inserted below the base of the dorsal fin and twisted (with or without a coloured glass bead); 4° about 8,500 half-yearlings marked by burning away the adipose fin. On the said safety-pins (of silver) and the double buttons (of silver or red celluloid) are found identification letters and number (for instance Da 316, Da II 156, L F 76). Up to now only some few of the salmon have been recaptured in the same river before they had left, 12 were taken when passing out of the fjord, and 2 specimens in the sea. One of the latter is particularly interesting: it was liberated in the Kongeaa on 18th April 1936 as a 2-year-old pond salmon weighing about 0.125 kg.; when it was recaptured in a fish-pot near Esbjerg on 29th July 1927, it measured about 65 cm. and weighed 3.25 kg. So it had been growing willingly, and we need not fear that the pond salmon shall be showing any signs of suffering in growth rate when liberated in free waters.—It is to be hoped that more marked salmon will be recaptured and the catches reported, so that some light may be thrown on the migration routes of the salmon in the North Sea.

An artificial changing of the salmon stock through liberations will hardly come into consideration in the near future. What has been liberated in the Storaa originates from mother fish from the same river; however, the fish liberated in the Kongeaa were derived from pond-bred salmon in Spjarup, the first origin of which, one or two generations ago, was a couple of salmon from the Vejle Fjord, presumably a couple of stray Baltic or Kattegat Salmon (19).

As there may be a difference between the salmon stocks of the different rivers of West Jutland, the material has been divided in such a way, that the 107 scale samples from the Skjern Aa are dealt with collectively; the remaining 18 samples are mostly used for comparisons.

Table I gives all the 125 scale samples. The information accompanying the scale samples was not always so exhaustive as might be desired, and so the table has been divided into 8 groups as far as the Skjern Aa salmon are concerned; both silvery salmon and kelt had to be grouped in 4 divisions: the weight of the fish was always given, but as to length and sex both may be stated or be lacking or only one of them given.

On the basis of Table I certain features may be accounted for. In the first place we will

examine how long a time the parr have spent in fresh water before their descent as smolt to the sea, and then we will compare the results with figures from other salmon waters.

A. The age of the smolt.

Years	107 salmon from the Skjern Aa	16 salmon from the Storaa	50 salmon from the Gudenaa (12)	East-Finmark (5)	Trøndelag (5)	Kristians-sand (5)	Mörrumsaa. Mean of 6 years (2)
1.....	12 = 11 %	..	13 = 26 %	0 %	0 %	0 %	7.5 %
1 or 2.....	1 = 1 %	1 = 6 %	6 = 12 %	..	..	..	..
2.....	90 = 84 %	13 = 81 %	30 = 60 %	2.5 %	6.5 %	18 %	80.2 %
2 or 3.....	..	1 = 6 %	..	..	..	..	..
3.....	4 = 4 %	1 = 6 %	1 = 2 %	47 %	67 %	68 %	12.3 %
3 or 4.....	..	..	..	..	..	..	..
4.....	..	..	..	43.5 %	26 %	13 %	..
4 or 5.....	..	..	..	..	..	..	..
5.....	..	..	..	7 %	0.5 %	1 %	..

Years	River Dee, Scotland			River Spey, Scotland			River Tweed, Scotland	
	1923 (16)	1924 (16)	1925 (16)	1923 (17)	1924 (17)	1925 (17)	1929 (15)	1930 (15)
1.....	0.2 %	0.4 %	0.15 %	0.05 %	0.3 %	0.1 %	5.1 %	6.4 %
2.....	84.9 %	82.1 %	67.5 %	65.8 %	74.3 %	74.2 %	92.4 %	90.9 %
3.....	14.7 %	17.3 %	31.3 %	33.75 %	25.1 %	25.2 %	2.5 %	2.7 %
4.....	0.2 %	0.2 %	1.0 %	0.4 %	0.3 %	0.5 %	..	..
5.....	..	..	0.05 %	..	..	..	..	..

The type is distinctly different from the Norwegian salmon: in West Jutland the salmon in many cases emigrated after only one year's stay in the river and have never used more than three years for this part of their development. They have also been quicker than the salmon from the River Dee and the River Spey but a little slower than the Gudenaa salmon. They show the best agreement with the salmon from the Mörrumsaa and the River Tweed. No corresponding analyses seem to exist of the salmon stocks of the Swedish rivers falling into the Kattegat, nor from the German, Dutch, and English rivers watering into the North Sea. The salmon of West Jutland will possibly agree in age of emigration with some of the stocks that have not been examined in this respect. As will appear from the survey the age of emigration may vary somewhat from year to year, most probably on account of the climatic conditions; the material of salmon from West Jutland was too small to allow a consideration of this factor.

It must be noted that we most frequently (in 59 or nearly half the 125 salmon examined[1])) find a distinct zone with close ridges as an introduction to the first year in the sea (Figures 1 and 2). Much the same fact is observed in various figures of salmon scales (Figures 21, 22, and 30), given by JÄRVI & MENZIES (10). At any rate in the case of the salmon of West Jutland it seems likely to me that we are dealing with an annual zone beginning in fresh water or rather in the mixing area outside it and continuing with a more rapid growth and more widely-spaced ridges when the fish has entered the sea. So the frequency of such scales in the salmon of West Jutland must presumably be ascribed to the fact that a large portion of the young descend-

[1]) In 9 out of 16 salmon from the river Storaa, in 49 out of 107 from the Skjern Aa, and in 1 from the Varde Aa.

ing fish remain for a month or more in the Nissum Fjord or the Ringkøbing Fjord, respectively, in brackish water, that is, before they continue into the North Sea. If this is correct and if this doubleness in the zone of the emigration year is not common in other salmon stocks, we have here a characteristic of the salmon of West Jutland and an indication that the salmon in question (or about half the specimens examined) are native to this area. But most probably this doubleness in the first sea zone is rather common in other localities, too, so that this peculiarity does not allow any fargoing conclusions.

In Table II are given the calculated lengths at the end of the individual growth periods of the 50 silvery not previously spawned salmon from the Skjern Aa the lengths of which were stated on the capture, and the scales of which did not already show erosions at the apex. It is seen that the lengths on the emigration to the sea are highly varying as will appear from the survey.

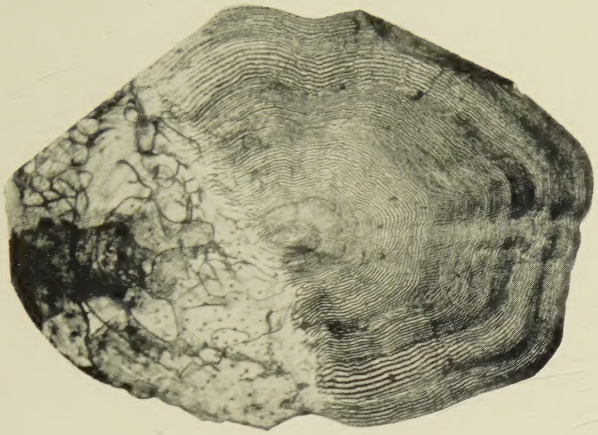
B. 50 silvery salmon from the Skjern Aa. Age and length on the emigration.

Age on emigration	No. of fish examined	Length on emigration	Mean
1 year	5	5.3—10.7 cm.	8.4 cm.
2 years	41	9.9—20.7 cm.	15.0 cm.
3 years	3	18.1—22.0 cm.	20.0 cm.

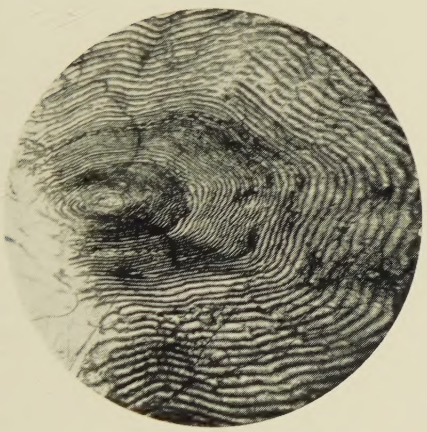
It is most surprising that a smolt of only 5.3 cm. in length should have descended to the sea. As supposed by Curt Segerstråle (23) in the case of the sea trout the calculations probably yield too small figures for the length of the fish during the first years of life.

Possibly, the growth of the males is a little slower than that of the females during the first years, but the material is too small for a conclusive determination. On their emigration as 2-year-old individuals 9 males averaged 14.3 cm. in length while 11 corresponding females measured 16.0 cm. In itself it seems probable because part of the young males have undoubtedly joined in the spawning. The maturity of such young males is often mentioned in the literature (Ant. Fritsch (8), Knut Dahl (5), Pierre Chimits (4), a. o.), and they were even used for the fertilization of stripped salmon eggs in Bohemia where they seem to have been present in large quantities and where the females seem to have emigrated earlier, so that Fritsch found up to 95 per cent. of males among the so-called "Struwitzen". Also Knut Dahl found mature males that had not yet emigrated: in Finmark they were at least 3 winters old, in Orkla at least 2, and still farther southwards, in Oselven, the youngest among the mature males were only 1 winter old. In the south of France, in Adour, Chimits even found male salmon of 7 months that were about to join in the spawning; he, too, found the males to be much more numerous (80 per cent. of males) than the females among the non-emigrated fish. It is true that we have no observations as to the maturity of such small salmon from West Jutland, but from a portion of salmon eggs from the Gudenaa, which were hatched in Vraa Mølle about 1907, some fry were liberated in a blocked up area of the Villestrup Aa, and among the (1- or 2-year-old) fish taken out here there proved to be mature males (18). However, the slower growth of the males seems to have asserted itself already during the first year of life (average length of the males 6.7 cm. against 8.1 cm. of the females), and in beforehand it could hardly be expected that part of our male salmon should become mature already during their first growth period.

The salmon of West Jutland seem to be growing comparatively slowly. The mean length

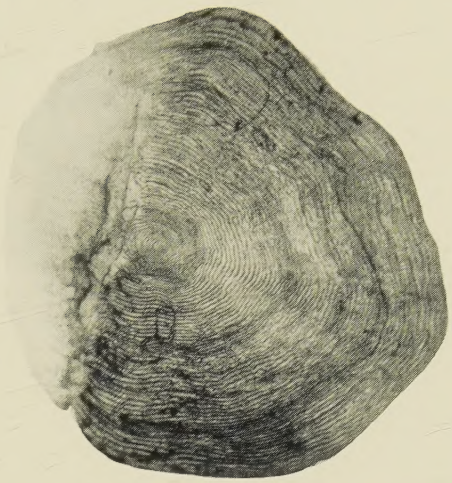


a



b

Figure 1. Salmon, silvery, 102 cm., 11.75 kg., the Skjern Aa, 1st May, 1932. — 2.4 with distinct "Fjord-Zone". a. Whole scale. b. Central part of the same scale.



a

b

Figure 2. Salmon ♀, silvery, 92 cm., 7.5 kg., the Skjern Aa, 17th April, 1932. — 2.4 without "Fjord-Zone". a. Whole scale. b. Central part of the same scale.

Digitized by the Internet Archive
in 2025

https://archive.org/details/meddelelser-kommissionnen-havundersogelser-fiskeri_1938_10_6

of 39 salmon from the Skjern Aa with 3 years' stay in the sea was 96.2 cm. (80—122 cm.), and their mean weight was 9.2 kg. (5—18 kg.). The mean length of 9 silvery salmon from the Skjern Aa with 4 years' stay in the sea was 104.7 cm. (88—120 cm.), their mean weight 12.4 kg. (6.5—20.5 kg.). The length figures approximately correspond to those found by Alm (2) in the river Dalelven, which are the lowest among the figures arrived at in 9 Swedish rivers falling into the Baltic. Nevertheless, the salmon of West Jutland are able to reach a rather considerable size: in recent years several are known to have weighed 20—23.5 kg.[1]).

During the years of sea life the most rapid growth is apparently found in the males, so that these do not only attain the same length as the females but even outgrow them by some centimetres; although the material is too small for a reliable estimate, a survey is given here.

C. Survey of growth in males and females.

Silvery salmon, the Skjern Aa	Number	Mean length						
		l_1	l_2	l_3	L_1	L_2	L_3	L_4
Males	10	6.7	14.3	..	49.4	83.3	99.1	..
Females	13	8.1	16.0	..	50.6	81.1	94.8	..
Sex unknown	27	7.2	14.7	..	51.7	79.6	95.0	109.3

The material allows us to estimate how many years the salmon of West Jutland spend in the sea before visiting the fresh water for the first time in order to spawn; cp. the surveys D and E.

D. Survey of the duration of first stay in the sea. 107 salmon from the Skjern Aa alone.

No. of years in the sea before first accent	Males		Females		The aforesaid + the individuals of unknown sex	
	Number	%	Number	%	Number	%
1	0	0	1	4	2	1.8
1 or 2	0	0	0	0	0	0.0
2	5	26	6	24	22	20.6
2 or 3	1	5	0	0	4	3.7
3	10	53	15	60	64	59.8
3 or 4	1	5	0	0	3	2.8
4	2	11	3	12	12	11.2
	19	100	25	100	107	99.9

It appears that on the whole the salmon of West Jutland are comparatively old when they first ascend the rivers: most of them have spent 3 years in the sea and more than 10 per cent. even 4 years. It should be remembered, however, that the anglers have undoubtedly taken more scale samples from the big than from the small salmon. A. C. Johansen & Chr. Løfting (12) found only one fish with 4 years of sea life (the D-Group = .4) among about 70 Gudenaa salmon, and Knut Dahl (5) says that the stay in the sea is only 'very occasionally' extended to 4 years

[1]) After the tables, etc., were finished I received a scale sample of such a big salmon: 115 cm., 21 kg., ♀, silvery, the Skjern Aa, 3rd March 1938, 2.4 with F; calculated lengths on the end of the growth periods: 7.3, 13.0, 58.1, 83.2, 105.2, and 115 cm.

E. Survey of the duration of first stay in the sea. 125 salmon from the rivers Skjern Aa together with Storaa, Varde Aa and Sneum Aa.

No. of years in the sea before first ascent	Males		Females		The aforesaid + the individuals of unknown sex	
	Number	%	Number	%	Number	%
1	0	..	1	..	2	1.6
1 or 2	0	..	0	..	0	0.0
2	8	..	7	..	26	20.8
2 or 3	1	..	1	..	5	4.0
3	16	..	21	..	76	60.8
3 or 4	1	..	0	..	3	2.4
4	2	..	4	..	13	10.4
	28	..	34	..	125	100.0

although in one case he found it to have lasted 5 years; JÄRVI & MENZIES (10), however, give some instances of salmon with 4 and 5 years of sea life, and ALM (1) says, "Ein Fluss kann also einen grossen Lachs mit hauptsächlich 2 und besonders 3 oder sogar bisweilen 4 Jahre Meeresaufenthalt . . . besitzen", and he brings a tabular survey of the conditions of the Swedish rivers watering into the Baltic. It is generally accepted that each stream has its special stock of salmon with their own characteristics, among them the duration of their stay in the sea; but other causes, too, might be supposed to assert themselves in West Jutland. The watercourses are here so small, that it may be difficult for the salmon to find them—the fish may be supposed to take a longer time than usually in discovering them; and if it should turn out that a great part of the salmon ascending the rivers of West Jutland are in fact stray fish, there will naturally be many fish among them with a long stay in the sea.

The ascending salmon from the Skjern Aa must all be supposed to have been caught a rather short time after their arrival in this river; they were taken (in the cases when the time of capture was stated) in the months between February and August (September), and the distinct differences between mean lengths and weights appear from the following survey F.

It is seen that the mean weight increases steadily between February and May, from 7.9 to 10.5 kg. Unlike this the Gudenaa salmon (A. C. JOHANSEN & J. CHR. LØFTING (12)) decreased steadily in weight during the same months from 7.7 to 5.9 kg. Correspondingly, the mean length of the Skjern Aa salmon increased steadily from 92.67 to 99.65 cm. while that of the Gudenaa salmon decreased from 91.6 cm. in February (93.3 cm. in January) to 85 cm. in May. A look at the conditions of the individual groups of the survey G will show that the rise is distinct in the C-Group whereas the salmon of the D-Group are too few for any conclusions

F. Length and weight of the ascending salmon in the individual months. The Skjern Aa, 1931—37.

Month of capture	Number measured	Mean length in cm.	Number weighed	Mean weight in kg.
January	0	...	0	..
February	3	92.67	3	7.92
March	16	97.13	16	9.67
April	23	98.61	25	9.96
May	13	99.65	15	10.53
June	0	..	1	..
July	1	..	4	5.06
August	1	..	1	..
September	0	..	1	..

to be drawn. The rise may perhaps be accounted for by the supposition that the North Sea salmon cannot always ascend as soon as they have reached an adequate size but often need a longer time to find a stream.

G. Silvery salmon, first ascent, the Skjern Aa. Mean weights of the groups in kg.

Month	The C-Group (= .3)		The D-Group (= .4)	
	Number of salmon	Mean weight	Number of salmon	Mean weight
February	3	7.92	0	..
March	11	8.32	2	18.0
April	18	9.90	5	10.0
May	9	9.89	2	12.6

If we examine the time when the silvery salmon of the A-, B-, C-, and D-Group (= .1, .2, .3, and .4 salmon) ascending for the first time were captured, we get the following:

H. Time of capture of silvery salmon.

Month of capture	Number of			
	A-Group	B-Group	C-Group	D-Group
January	0	0	0	0
February	0	0	3	0
March	0	0	11	2
April	0	0	19	4
May	0	1	10	1
June	0	0	1	0
July	0	2	2	0
August	0	0	1	0
September	0	1	0	0
	0	4	47	7

If, like A. C. Johansen & J. Chr. Løfting (12), we make a distinction between winter and summer salmon in such a way that the former are fish ascending before, the latter fish ascending after 1st May, and if, for practical reasons, we identify the date of capture with the date of ascent, which of course may lead to considerable errors as the salmon may perhaps bite as late as about two months after the ascent, we get the following result: Group A is not represented in the present sample, which goes well with Løfting's (14) impression mentioned above, viz. that it is absent or weakly represented in West Jutland; Group B is weakly represented and includes summer salmon only; Group C mainly consists of winter salmon, about $^1/_2$ being summer salmon: Group D no doubt exclusively consists of winter salmon—the one specimen taken on 13th May is sure to have entered the river before the beginning of the month.

Among the 125 salmon examined none at all belonged to the A-Group, but among the previously spawned fish 2 had belonged to the A-Group when they entered for the first time in order to spawn.

As far as the condition of the silvery salmon is concerned an examination was made with the part of the material for which satisfactory data were at hand; salmon of less than 90 cm. in length were excluded (cp. A. C. Johansen & J. Chr. Løfting (12)). It should be kept in mind that the statements of both length and weight are often sure to be somewhat inaccurate, mostly rather high. In the calculation of the coefficient of nutrition was used Fulton's formula: The weight in grammes / 100 = the length in centimetres in the third power / the coefficient (k). As will be seen from the survey I the coefficient of nutrition is very much the same whether it be calculated for 8 males, 13 females, or 23 other salmon not determined to sex, being 1.05, 1.04, and 1.04, respectively. If the salmon are divided into winter salmon and summer salmon, we get for the 33 winter salmon k = 1.02, for the 11 summer salmon k = 1.16. So far these figures do not correspond with the results from the Gudenaa where the winter salmon were

in a better condition than the summer salmon (k = 0.96 and 0.94, respectively); but if the fish below 90 cm. in length are also excluded from the Gudenaa salmon, the coefficient of nutrition for the winter salmon is exactly the same as in West Jutland (1.02); the summer salmon of the Gudenaa material were nearly exclusively fish of less than 90 cm. Consequently, the condition of the salmon of West Jutland seems not to be inferior but rather superior to that of the Gudenaa salmon, which again seem to be in a better condition that salmon taken in the sea at Bornholm. These calculations may of course be influenced by the accuracy with which lengths and weights have been stated, but this question evades control[1]).

I. The coefficient of nutrition (k) for silvery salmon of more than 90 cm., caught in the Skjern Aa between 15th February and 27th May.

8 ♂♂.

Length in cm.	Date of capture	Weight in g.	k
95	15th April 1934	9,000	1.05
96	14th Mar. 1933	7,250	0.82
98	6th April 1932	9,500	1.01
98	23rd April 1932	10,000	1.06
100	4th April 1934	11,000	1.10
103	23rd May 1933	13,500	1.27
108	5th May 1935	13,000	1.03
108	13th May 1932	13,500	1.07
		Mean figure:	1.05

13 ♀♀.

91	15th Mar. 1933	7,000	0.93
92	2nd April 1934	7,500	0.96
92	17th April 1932	7,500	0.96
93	15th May 1935	8,750	1.09
93	25th Feb. 1934	9,000	1.12
95	29th Mar. 1933	8,500	0.99
96	30th April 1932	10,000	1.13
96	4th Mar. 1936	9,250	1.05
98	13th April 1932	9,000	0.96
98	23rd May 1933	10,500	1.12
100	18th May 1936	12,500	1.25
103	25th April 1935	10,750	0.98
106	20th April 1935	11,500	0.97
		Mean figure:	1.04

23 without statements of sex.

Length in cm.	Date of capture	Weight in g.	k
90	26th Mar. 1933	9,500	1.29
91	27th Mar. 1933	7,500	1.00
92	14th May 1933	8,000	1.03
93	10th Mar. 1934	8,250	1.03
94	Mar. 1934	8,250	0.99
94	14th April 1932	8,500	1.02
94	2nd April 1931	10,000	1.20
96	27th May 1937	9,500	1.07
97	15th Feb. 1934	8,000	0.88
97	17th April 1935	9,000	0.99
97	28th Mar. 1933	9,250	1.01
98	26th April 1936	10,500	1.12
99	24th Mar. 1932	9,000	0.93
99.5	4th May 1932	9,750	0.99
100	3rd April 1931	8,850	0.89
100	26th Mar. 1933	9,500	0.95
101	27th April 1935	11,000	1.07
102	1st May 1932	11,750	1.11
106	2nd April 1931	12,500	1.05
113	19th April 1931	14,600	1.01
113	18th May 1936	16,500	1.14
115	Mar. 1934	15,500	1.02
120	24th Mar. 1935	20,500	1.18
		Mean figure:	1.04

Of the 125 salmon from West Jutland 63 (possibly 65)—61 (possibly 63) of them from the Skjern Aa –were taken ascending to their first spawning and 51—35 from the Skjern Aa –were caught as kelt or mended kelt; 9 (possibly 11) specimens—all from the Skjern Aa—were previously spawned fish. It cannot be said whether any males were found among the last mentioned group because the sex of only 4 of them was stated, and they were all females. All individuals determined as males (28) were first-time-spawners while 4 (= 11.8 per cent.) of the 34 specimens determined as females had spawned before. The number is not very large,

[1]) The highest coefficient of nutrition (1.38) was found in the salmon mentioned in the footnote of p. 7; this fish was not considered in the survey.

but this does in no way mean that it should be against the nature of the salmon to spawn more than once, a view of former times which, among other things, caused the existing protection of kelt below 523 mm. in length to be abolished by the Fresh Water Fisheries Act of 1917. The spent salmon are often capable of living, a fact which is easily established by simply noticing that no less than 39 of these 125 salmon—6 males, 8 females, and 25 of unknown sex — were caught by anglers after the spawning, a proof that they were vigorous enough to search for food. If they had not been caught, they would undoubtedly have been able to regain the sea. In the present stocks of salmon we rarely come across fish that have survived more than two spawnings: JÄRVI & MENZIES (10) mention one that has spawned 4 times, and at the Danish Biological Station we have a scale sample of a salmon that had spawned three times and was silvery when caught in the sea at Bornholm (3rd May 1921, 23.5 kg., 3.2G1G2G1+); but nowadays such fish are exceptions. However, the pond-bred salmon can be stripped year by year without any great mortality the first times (19, 20). It seems certain to me that it would be much to the benefit of the stocks of salmon—at any rate in our quietly flowing streams where no great obstacles impede the salmon in its debilitated state after spawning—if the kelt were allowed a peaceful retreat to the sea. The uncertainty arising from the facts that the mended kelt are often mistaken for silvery fish and that we cannot at any rate prevent them from biting although the object of fishery is properly the silvery salmon, could be eliminated by protecting both the kelt and the silvery salmon (together with the trout) for some period—preferably 3 months[1])—beyond the present close season, which covers only the months of November and December. If the kelt do not leave the rivers until in the course of March, it will hardly suffice to protect them in January and February because they will then undoubtedly be caught in March. The kelt that were caught in the Skjern Aa during the first half of the year and from which scale samples are at hand, are distributed as follows within the individual months:

J.

Month	January	February	March	April	May	June
Number of kelt...	4	12	14	4	1	0

At their ascent into the river the 107 salmon of the Skjern Aa had finished the following numbers of growth periods:

K.

Growth periods	3	3 or 4	4	4 or 5	5	5 or 6	6
Number of salmon	3	0	19	5	58	4	18

Accordingly, the average age of the salmon at their last ascent was little less than 5 growth periods (4.93), and the remaining 18 salmon from West Jutland give a similar figure (4.83). So these salmon have ascended about 5 years after they were hatched, or about 6 years after the ascent of their parents. In other words we would expect another good salmon year to follow about 6 years after a year with many ascending fish (rich fishery); but this cannot be said to be the case in West Jutland[2]).

[1]) In the Fishery Regulations for the lower part of the Skjern Aa is stipulated a close season from 15th October to 1st March. The Fishermen's Association for Holstebro and surroundings observes a similar close season in the river Storaa.

[2]) JÄRVI (11) is of opinion that the quantity of fish that have spawned can be taken as a factor influencing the abundance of the individuals of the year-class being bred, but he considers it likely that it is of secondary importance only. The greatest influence in this respect he puts down to the climatic conditions during the winter of hatching (height

The statistics (24) concerning the catches of salmon in West Jutland are highly insufficient as already emphasized by Løfting (14): from the rivers themselves we have no available statements at all covering a successive series of years; we are better informed of what has been caught in the fjords, and this is more important because the quantities caught in the fjords may be put at several times the amounts caught in the rivers falling out here –the proportion may perhaps be estimated at 10 to 1. It may be added that the salmon apart from the smolt

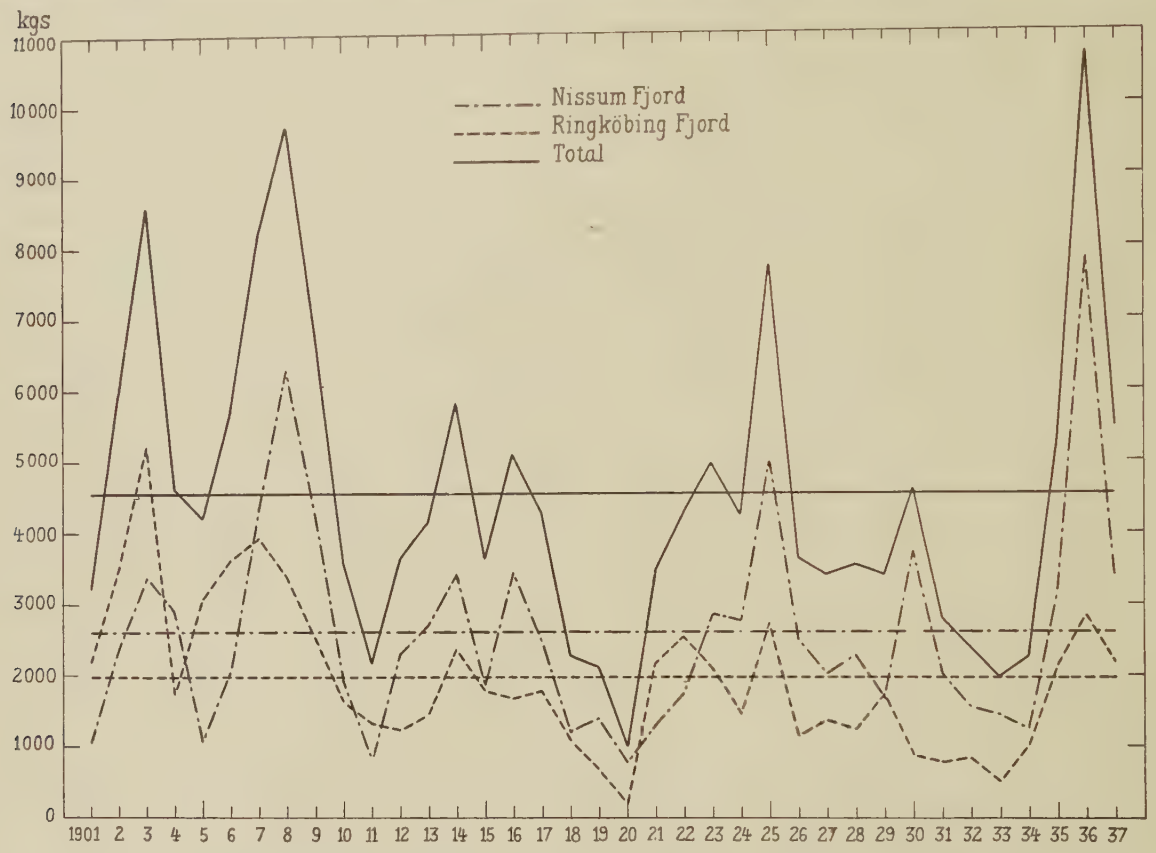


Figure 3. Weight quantity of salmon caught in the Nissum Fjord and in the Ringkøbing Fjord and in the two Fjords together. The horizontal lines indicate the mean catches for 1901—1937.

(see above), only visit the fjords on their way to and from the river and that they hardly stay very long in the fjords. No doubt some silvery trout have been put down as salmon, particularly in former times; nevertheless, the statistics give a rather good idea of the size of the stock. Table III and Figure 3 tell of the following catches during the 37 years between 1901 and 1937: in the Nissum Fjord 790—7830 kg., an annual mean of 2603 kg.; in the Ringkøbing Fjord 204—5206 kg., an annual mean of 1953 kg.; the catches were extremely variable. However, it is easily seen that in the main the graphs of the two fjords are very much like each other— to a maximum of one corresponds a maximum of the other, and this also holds good of the

of water in the rivers and the frost conditions). However, the climatic conditions of West Jutland are quite different from those of Finland, the winter short and mild and the precipitation areas of the rivers moreover comparatively small, so that the fluctuations of water level are of inferior importance; in West Jutland the number of spawning salmon is undoubtedly the principal factor influencing the abundance of the hatched fry.

minima. But there is no conspicuous regularity in the run of the graphs. Maxima are found in the following years:

The Nissum Fjord.....	1903	..	1908	1914	1916	..	1925	1930	1936
The Ringkøbing Fjord.....	1903	1907	..	1914	..	1922	1925	..	1936

It seems impossible to find any fixed rhythm of the graphs though there are often 5 or 6 years between their apices. A striking irregularity appears in the years 1919—20: instead of the expected apex we here find a deep fall; in the Nissum Fjord it is possibly due to particularly difficult conditions of outflow at Thorsminde during these years (24; 1919, p. 17 and 1920, p. 18), but such causes would not seem to exist in the Ringkøbing Fjord. So it is quite contrary

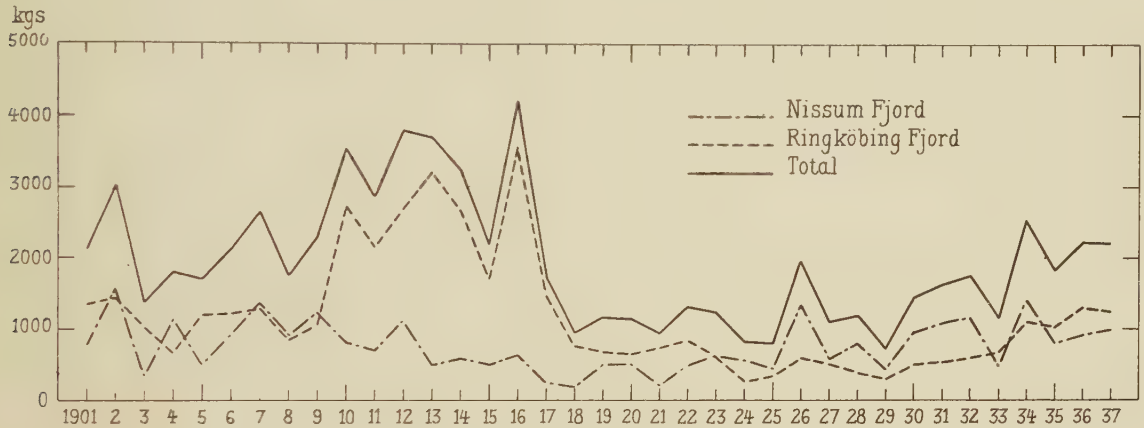


Figure 4. Weight quantity of trout caught in the Nissum Fjord and the Ringkøbing Fjord and in the two Fjords together.

to our expectations that we find a small stock of salmon in these years; or did the fish go elsewhere in order to spawn? However, in spite of the failing ascent in 1919—20 we find an outspoken maximum in 1925! In fact this makes it most probable that we are dealing with salmon that have not been hatched in the streams of West Jutland.

Very probably the ascent changes from the Nissum Fjord to the Ringkøbing Fjord when the access to the former locality is choked up with sand (possibly the case in 1907 and 1922).

If the fluctuations of the salmon catches in the fjords of West Jutland were caused by such conditions as a more or less easy ascent in the individual years (power of the stream, barrings) or a more or less intense fishery, we would expect to find corresponding fluctuations in the graphical representation of the trout catches although the ascent of the trout takes place later in the year. However, the graph representing the catches of trout in two fjords of West Jutland (Figure 4) shows no analogy to the salmon graph. Apparently, the catches of trout before 1910 were not very different from what they are now, perhaps a little heavier; but between 1910 and 1916 the trout fishery was considerably better in the Ringkøbing Fjord, no doubt a consequence of the changed conditions of the Fjord after the opening of the Hvide Sande Canal in 1910. From 1917 followed a series of years with rather light catches (less than 2,000 kg.) and small fluctuations, but during recent years the yield once more seems to show a rising tendency. It should be noted that the trout (unlike the salmon) did not show any distinct minimum of the catches in 1920.

Unfortunately, the statistics say very little about the catches in the very rivers; we may take it that the salmon caught by rod and line and part of those caught by commercial fishermen were not considered. The truth can hardly be approached in a better way than by making the following estimates of the annual average catches:

Storaaen	200 kg.	Kongeaaen	100 kg.
Skjern Aa	300 kg.	Ribe Aa	200 kg.
Varde Aa	300 kg.	Vidaaen	200 kg.
Sneum Aa	300 kg.		

Besides in these 7 rivers ascending salmon are possibly found in the Brede Aa, but they do not enter the streams north of the Limfjord nor do they appear in the very Limfjord although both localities have good trout streams with ascending sea trout. The lack of salmon stocks in these streams can hardly be ascribed to the want of suitable spawning places and good nursery grounds for the salmon fry; if anything, it must be put down to the incapability of the salmon to find these streams. In itself it would be an interesting experiment one year to put out salmon fry (or perhaps marked fingerlings) in large numbers in one of these streams; however, if the salmon were able to recover these streams, a natural stock would undoubtedly already be found in them.

If we sum up our figures for the silvery salmon in the Skjern Aa, we find that 68 speci-

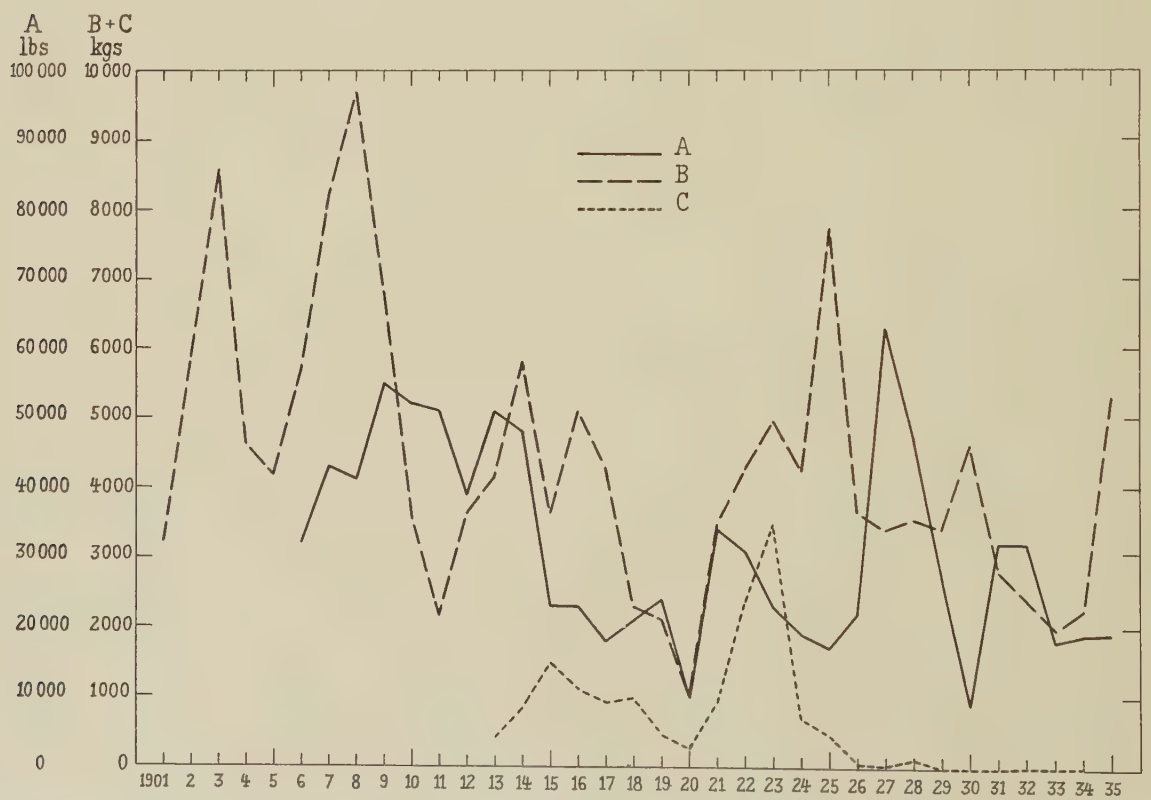


Figure 5. A. Weight quantity of salmon (in lb.) caught in rivers of East England (Yorkshire Rivers, Esk, Tees, Wear, and Tyne); before 1926, however, partly trout. — B. Catches (in kg.) of salmon in West Jutland. — C. Catches (in kg.) of salmon from the River Gudenaa and the Randers Fjord).

mens weighed 647.40 kg., the mean weight consequently being 9.52 kg. From these figures we can approximately calculate the quantities of salmon caught in the fjords, although several kelt of inferior weight undoubtedly occur in the fjord catches, their comparative number, however, hardly being so large as in the rivers above. To the average catch of 1953 kg. of salmon in the Ringkøbing Fjord must correspond at least 205 specimens, and to the average catch of 2603 kg. of salmon in the Nissum Fjord would then presumably correspond at least 273 specimens. If the fish caught in these fjords and the streams above belong to local stocks, they are so few in number, that they may easily be exposed to a crisis similar to the one which exterminated the Gudenaa stock. But if most of the fish caught at the west coast are stray individuals from foreign stocks, the catches in West Jutland will principally depend on the thriving of the stocks in their native places.

It will therefore be of interest to compare the salmon catches in West Jutland with the corresponding catches in the rivers of East England (25), cp. Figure 5; there does not seem to be any kind of parallelism apart from the same deep minimum in 1920, which in the English rivers (but not in West Jutland) was followed by minima 5 and 10 years later. A comparison with the Gudenaa catches would be desirable, but the statistics for the Gudenaa and Randers Fjord between 1899 and 1912 are deficient; E. M. Poulsen's (22) statistics beginning in 1913 show that also the Gudenaa salmon had a minimum in 1920; few years after the founding of the Tange Generating Station the salmon stock decreased extremely rapidly and was at last completely exterminated, and so the later statistics from the Gudenaa cannot be used for a comparison with the catches in West Jutland. Comparisons with other stocks of salmon might perhaps yield some result, but adequate statistics seem to be unavailable.

The question whether the salmon of West Jutland make up a local stock or to a higher or less degree are recruited from foreign stocks could not be finally answered here. But the question has been put, and we shall no doubt be able to answer it some time by means of an increased material of scales and more comprehensive statistics; we may also hope to solve the problem by marking experiments. Most likely the fish ascending the rivers of West Jutland are composed partly of local, partly of foreign salmon. The latter are perhaps individuals that have strayed from the normal migration routes of the stock in question; they may originate from many different stocks, or they may principally be derived from one or some few stocks[1]). The high age that is often found in the ascending fish (—.4) may be connected with these salmon being stray individuals.

If the ascending body of salmon contains a changing but often rather considerable percentage of such foreign fish, it is no wonder that we do not find any marked regularity in the run of the catch graphs and their distribution of maxima and minima—these graphs would then be greatly dependent on the factors determining the migrations of the salmon in the sea.

[1]) Salmon marked abroad have not yet been taken at the western coast of Jutland. However, a sea trout marked in the River Tweed in January, 1929, was recaptured in the same year off the Husby Klit (Ferskvandsfiskeribladet, 1930, p. 61).

Table I. Age determinations of salmon from West Jutland.

A. The Skjern Aa.

1. Silvery salmon with statements of length, weight, and sex.

11 ♂♂.

84 cm.	6.0 kg.	21st Aug. 1934	2.3+[1] or 2.3+	F[2]
88 -	6 -	5th April 1934	1.4	F
95 -	9 -	15th April 1934	2.3	
96 -	7.25 -	14th Mar. 1933	2.3	F
98 -	9.5 -	6th April 1932	2.3	
98 -	10 -	23rd April 1932	2.3	
100 -	11 -	4th April 1934	2.3	
103 -	13.5 -	23rd May 1933	2.3	F
108 -	13 -	5th May 1935	2.3	F
108 -	13.5 -	13th May 1932	2.4	F
122 -	18[3] -	13th April 1936	2.3	

16 ♀♀

85 cm.	7 kg.	24th May 1936	2.2+	F
89 -	7 -	4th April 1934	2.2G1	
91 -	7 -	15th Mar. 1933	1.3	F
92 -	7.5 -	2nd April 1934	2.3	
92 -	7.5 -	17th April 1932	2.4	
93 -	8.75 -	15th May 1935	2.3	
93 -	9 -	25th Feb. 1934	1.3	F
95 -	8.5 -	29th Mar. 1933	2.3	
96 -	9.25 -	4th Mar. 1936	2.2G1	
96 -	10 -	30th April 1932	2.3	F
98 cm.	9 kg.	13th April 1932	2.4	F
98 -	10.5 -	23rd May 1933	2.3	F
98 -	10.5 -	4th May 1935	2.2G1	F
100 -	12.5 -	18th May 1936	3.3	
103 -	10.75 -	25th April 1935	2.3	F
106 -	11.5 -	20th April 1935	2.3	F

2. Silvery salmon with statements of weight and sex.

2 ♂♂.

..[1]	4.25 kg.	6th Sept. 1935	2.2	F
..	12.5 -	18th Juni 1935	2.3	

1 ♀.

..	5 kg.	6th July 1932	2.3+	

3. Silvery salmon with statements of length and weight. 31 specimens.

70 cm.	3 kg.	20th July 1935	2.2	
80 -	7.7 -	14th April 1934	2.3	F
83 -	7.5 -	28th Mar. 1932	2.3	F
88 -	6.75 -	26th Feb. 1934	2.3	
90 -	7.5 -	2nd Mar. 1934	2.2G1 or 2.3	
90 -	9.5 -	26th Mar. 1933	2.3	
91 -	7.5 -	27th Mar. 1933	2.3	F
92 -	8.0 -	14th May 1933	3.3	
93 -	8.25 -	10th Mar. 1934	2.3	
94 -	8.25 -	Mar. 1934	2.3	F
94 -	8.5 -	14th April 1932	2.3	
94 -	10 -	2nd April 1931	2.3	F
96 -	9.25 -	1935	2.3	F
96 -	9.5 -	27th May 1937	2.3	
97 -	8 -	15th Feb. 1934	2.3	F
97 -[2]	9 -	17th April 1935	2.3	F
97 -	9.25 -	28th Mar. 1933	2.3	F
98 -	10.5 -	26th April 1936	3.3	
99 -	9 -	24th Mar. 1932	2.3	F
99.5 -	9.75 -	4th May 1932	2.3 or 2.4	
100 -	8.85 -	3rd April 1931	1.3	F
100 -	9.5 -	26th Mar. 1933	2.3	F
101 -	11 -	27th April 1935	2.3	F
102 -	11.75 -	1st May 1932	2.4	F
104 -	10.5 -	4th Mar. 1934	1.3G1 or 1.4	F
106 -	12.5 -	2nd April 1931	2.4	
108 -	13.5 -	24th April 1935	2.1G2	
113 -	16.5 -	18th May 1936	2.2G1	F
113 -	14.6 -	19th April 1931	2.4	

[1]) 2.3 means that the salmon has spent two growth periods in fresh water and after that three periods in the sea. A + against the figure indicates that an unfinished ridge is found at the margin of the scale; such a ridge is found on the scales of some, but not nearly all, of the salmon entering in order to spawn; JÄRVI & MENZIES (10) say about this that the older salmon arrive first, then the .2+ salmon and finally the .1+ salmon, and so the two groups last mentioned show a summer growth of the scales, which is rarely the case with the oldest salmon. As far as the salmon of West Jutland is concerned such a + growth cannot always be detected, not even in the youngest of the ascending salmon. On the other hand also some few .3 salmon may be found to show a + growth of the scales (as for instance the specimen ♂, 84 cm., 6 kg., 21st Aug. 1934). — 2.2G1 means that the salmon after 2 growth periods in fresh water and 2 in the sea has visited the fresh water for the purpose of spawning, after which it has left again and spent one growth period in the sea.

[2]) F denotes that the first sea zone begins with close ridges (a "Fjord Zone").

[3]) Weighed 18 kg. on the day after the capture; is supposed to have weighed about 20 kg. when captured.

[1]) Coloured.

[2]) .1 with check.

115 cm.	15.5 kg.	Mar. 1934	1.4	
			or 2.4	
120 -	20.5 -	24th Mar. 1935	2.4	F

4. Silvery salmon with statements of weight. 7 specimens.

4	kg.	26th July 1935	2.2	F
5	-	4th May 1931	2.3	
6.5	-	19th April 1931	2.3	
8.25	-	21st July 1935	2.3+	F
8.25	-	11th May 1935	2.3	
9	-	13th April 1936	1.3	F
9.75	-	1935	2.3	

5. Kelt with statements of length, weight, and sex.

5 ♂♂.

79 cm.	3 kg.	1st Mar. 1936	2.2G	
87 -	4.5 -	.....	1.2G	F
88 -	5 -	1st Mar. 1932	2.2G	
			or 2.3G	
90 -	4.5 -	1st Mar. 1936	2.2G	F
99 -	6.5 -	21st Feb. 1932	1.3G	F
			or 1.4G	F

7 ♀♀.

69 cm.	2.5 kg.	8th Mar. 1932	3.2G	
82 -	4 -	19th Mar. 1935	2.3G	
87 -[1])	3.75 -	25th Feb. 1934	2.2G	F
90 -	4.5 -	7th April 1933	2.3G	
94 -	6 -	5th Mar. 1932	2.4G	
96 -	6 -	6th Feb. 1936	2.3G	
98 -	6 -	25th Mar. 1933	2.3G	F

6. Kelt with statements of weight and sex.

2 ♂♂.

..	4.0 kg.	14th Mar. 1937	2.2G	F
..[2]) abt.	7.5 -	29th Oct. 1935	..	

1 ♀.

..	5 kg.	21st Feb. 1932	2.1G2G	

7. Kelt with statements of length and weight. 21 specimens.

64 cm.	2 kg.	24th Mar. 1934	2.2G	
81 -	4.5 -	1935	2.2G1G	F
82 -	3.5 -	16th Feb. 1936	2.2G	F
85 -	3.75 -	27th Jan. 1936	2.2G	
85 -	3.75 -	27th Jan. 1936	3.2G	
85 -	4.0 -	2nd Feb. 1936	2.2G	F
			or 2.3G	F
86 -	4.3 -	15th Mar. 1931	2.3G	
86 cm.[1])	8.5 kg.	20th April 1932	2.4G	
			or 2.4	
87 -	4.25 -	14th Feb. 1933	1.3G	
			or 2.3G	
89 -	4.85 -	14th Mar. 1934	1.2G1G	
90 -	4.75 -	2nd Jan. 1936	2.2G	F
90 -	5.0 -	28th Jan. 1936	2.2G	
			or 2.3G	
90 -	5.0 -	3rd Feb. 1936	2.3G	
91 -	4.5 -	1936	2.3G	
92 -[2])	4.1 -	1st Feb. 1935	2.3G	F
92 -	5.25 -	3rd April 1931	2.2G2G	F
94 -	5 -	2nd April 1931	2.3G	
94 -	5.5 -	15th Feb. 1933	2.3G	
95 -[3])	5.25 -	7th Feb. 1936	1.3G	
95 -	7 -	25th Mar. 1932	2.4G	
97 -	5.75 -	7th Feb. 1936	2.3G	

8. Kelt with statements of weight. 4 specimens.

3.5 kg.	30th Mar. 1931	2.3G	
3.85 -	1936	2.3G	
4.25 -	9th May 1931	2.3G	F
4.90 -	15th Mar. 1931	2.3G	

B. Storaaen.

Stripped salmon with statements of length, weight, and sex.

8 ♂♂.

65 cm.	2.5 kg.	Nov.-Dec. 1936	2.2G	
66 -	3.25 -	Nov.-Dec. 1936	2.2G	F
81 -	6.25 -	2nd Jan. 1936	2.3G	F
88 -	6.25 -	2nd Jan. 1936	2.3G	F
91 -	5 -	2nd Jan. 1936	3.3G	
92 -	5.5 -	Nov.-Dec. 1936	2.2G	
			or 3.2G	
96 -	6.75 -	2nd Jan. 1936	2.3G	
102 -[4])	8 -	Nov.-Dec. 1936		

9 ♀♀.

73 cm.	3.6 kg.	2nd Jan. 1936	2.2G	F
83 -	4 -	2nd Jan. 1936	2.3G	F
84 -	4 -	Nov.-Dec. 1936	2.3G	
86 -	4.5 -	Nov.-Dec. 1936	2.3G	F
91 -	5.5 -	Nov.-Dec. 1936	2.2G	F
			or 2.3G	F
96 -	6.5 -	Nov.-Dec. 1936	2.4G	F
97 -[5])	7.5 -	Nov.-Dec. 1936	1.3G	F
98 -	6.5 -	2nd Jan. 1936	2.3G	
100 -	7.5 -	Nov.-Dec. 1936	2.3G	

[1]) Uncertain.

[2]) Scales so much absorbed, that they cannot be read.

[1]) Stated to be a kelt; was it not a maiden fish?

[2]) .1 with check.

[3]) Absorption not very advanced.

[4]) Only one scale, a substitutional one.

[5]) .1 with check.

C. The Varde Aa.

Silvery salmon, ♂.

11.75 kg.	May 1936	2.3	F	86 cm.[1]) 5.5 kg. 10th Aug. 1921
				100 - [2]) 9 - 5th May 1936 2.3

D. The Sneum Aa.

Silvery salmon.

Table II. Calculated lengths at the end of the individual growth periods of silvery salmon (without spawning mark) caught in the Skjern Aa between 15th February and 20th July[3]).

10 ♂♂.

Length in cm.	Weight in kg.	Date of capture	l_1	l_2	l_3	L_1	L_2	L_3	L_4
88	6.5	5th April 1934	5.3[4])	..	..	44.6	69.1	88.0	..
95	9	15th April 1934	7.8	15.5	..	51.4	79.5	95.0	..
96	7.25	14th Mar. 1933	5.8	9.9	..	48.3	79.7	96.0	..
98	9.5	6th April 1932	7.3	20.0	..	52.4	82.3	98.0	..
98	10	23rd April 1932	8.5	18.3	..	56.0	90.1	9 8.0	..
100	11	4th April 1934	6.3	13.2	..	50.0	86.2	100.0	..
103	13.5	23rd May 1933	6.6	14.8	..	52.0	89.3	103.0	..
108	13	5th May 1935	7.0	12.8	..	48.8	92.9	108.0	..
108	13.5	13th May 1932	6.2	11.2	..	48.4	78.2	98.1	108.0
122	18[5])	13th April 1936	6.1	13.1	..	42.4	85.7	106.9	122.0
		Mean:	6.7	14.3	..	49.4	83.3	99.1	..

13 ♀♀.

85	7	24th May 1936	7.3	13.4	..	52.2	85.0	..	..
91	7	15th Mar. 1933	9.2	..	..	51.1	79.8	91.0	..
92	7.5	2nd April 1934	8.4	19.1	..	55.0	81.2	92.0	..
92	7.5	17th April 1932	9.6	20.3	..	49.0	69.3	81.3	92.0
93	8.75	15th May 1935	6.4	12.7	..	44.1	76.4	93.0	..
93	9	25th Feb. 1934	10.7	..	..	52.1	82.3	93.0	..
95	8.5	29th Mar. 1933	5.0	12.5	..	55.0	86.3	95.0	..
96	10	30th April 1932	6.8	13.6	..	44.8	79.4	96.0	..
98	9	13th April 1932	7.0	15.0	..	49.8	73.4	89.4	98.0
98	10.5	23rd May 1933	8.1	18.3	..	52.4	80.1	98.0	..
100	12.5	18th May 1936	9.1	17.6	22.0	52.4	82.9	100.0	..
103	10.75	25th April 1935	10.1	16.5	..	47.5	86.0	103.0	..
106	11.5	20th April 1935	7.9	16.7	..	53.0	92.3	106.0	..
		Mean:	8.1	16.0	..	50.6	81.1	94.8	..

27 without statements of sex.

70	3	20th July 1935	7.9	18.1	..	55.1	70.0	..	..
80	7.7	14th April 1934	5.4	11.4	..	48.7	68.0	80.0	..
83	7.5	28th Mar. 1932	7.1	..	..	43.5	68.8	83.0	..
88	6.75	26th Feb. 1934	7.9	15.9	..	48.8	76.6	88.0	..
90	9.5	26th Mar. 1933	6.3	12.5	..	56.8	80.0	90.0	..
91	7.5	27th Mar. 1933	5.5	11.6	..	53.0	80.0	91.0	..
92	8.0	14th May 1933	6.3	13.6	19.9	48.3	77.4	92.0	..
93	8.25	10th Mar. 1934	8.0	15.9	..	49.2	77.1	93.0	..
94	8.25	Mar. 1934	7.8	14.4	..	61.4	84.9	94.0	..

[1]) Only 1 scale at hand. [2]) ♂.

[3]) The scales of salmon caught after this date showed erosions at the margin.

[4]) The average of several measurements ranging between 4.6 and 5.8.

[5]) Cp. foot-note of Table I.

Length in cm.	Weight in kg.	Date of capture	l_1	l_2	l_3	L_1	L_2	L_3	L_4
94	8.5	14th April 1932	7.9	17.2	..	46.6	78.1	94.0	..
94	10	2nd April 1931	7.9	14.5	..	61.1	84.8	94.0	..
96	9.25	1935	5.9	12.9	..	58.5	89.0	96.0	..
96	9.5	27th Mar. 1937	5.4	10.8	..	56.8	85.2	96.0	..
97	8	15th Feb. 1934	7.5	16.2	..	42.3	80.8	97.0	..
97	9	17th April 1935	6.0	11.4	..	51.8	71.9	97.0	..
97	9.25	28th Mar. 1933	6.6	13.3	..	47.8	85.0	97.0	..
98	10.5	26th April 1936	7.3	14.5	18.1	52.0	82.3	98.0	..
99	9	24th Mar. 1932	8.1	20.7	..	49.5	89.8	99.0	..
99.5	9.75	4th May 1932	9.6	18.6	..	59.1	79.3	92.1	99.5
100	8.85	3rd April 1931	9.7	..	..	53.9	83.1	100.0	..
100	9.5	26th Mar. 1933	5.6	15.9	..	55.6	82.2	100.0	..
101	11	27th April 1935	8.5	13.4	..	45.0	79.1	101.0	..
102	11.75	1st May 1932	9.5	20.0	..	52.5	82.0	95.3	102.0
106	12.5	2nd April 1931	7.8	16.8	..	47.8	76.3	94.4	106.0
113	14.6	19th April 1931	5.9	11.8	..	42.0	78.6	95.9	113.0
115	15.5	Mar. 1935[1])	?	?	..	56.8	76.7	100.8	115.0
120	20.5	24th Mar. 1935	4.6	10.3	..	51.4	82.3	110.9	120.0
		Mean:	7.2	14.7	..	51.7	79.6	95.0	109.3

Table III. Catches of salmon in West Jutland (according to the Fishery Reports). Quantities in kilogrammes[2]).

Year	The Nissum Fjord	The Storaa	The Ringkøbing Fjord	The Skjern Aa	The Varde Aa	The Sneum Aa	The Konge-aa	The Ribe Aa	The Brede Aa	The Vidaa
1901.....	1,048	..	2,165	200	+	+	..	+	..	..
1902.....	2,377	..	3,559	..	..	..	..	..	..	..
1903.....	3,374	..	5,206	165	..	..	..	..	..	..
1904.....	2,899	..	1,724	194	..	..	..	..	..	..
1905.....	1,069	..	3,103	..	..	..	..	..	..	..
1906.....	2,055	..	3,612	..	..	..	..	..	..	..
1907.....	4,290	..	3,929	996	..	+	+	..	..	..
1908.....	6,299	..	3,387	761	..	..	..	..	..	..
1909.....	4,257	..	2,545	602	139	402	100	1,000	..	..
1910.....	1,935	..	1,636	739	478	..	..	..	..	..
1911.....	823	..	1,348	175	205	140	..	..	..	..
1912.....	2,382	..	1,241	+	+	+	+	+	..	..
1913.....	2,695	..	1,451	..	+	445	..	..	..	..
1914.....	3,429	..	2,371	more than usual	607.5	..	..	..	..	..
1915.....	1,857	..	1,771	+	..	..	..	..	..	..
1916.....	3,439	..	1,668	65	..	..	..	..	..	..
1917.....	2,499	..	1,788	280	..	..	..	..	..	..
1918.....	1,211	..	1,094	98	..	..	..	..	..	..
1919.....	1,403	..	709	..	..	..	..	..	..	..
1920.....	790	..	204	22.5	..	..	..	..	..	..

(To be continued)

[1]) From the Ringkøbing Fjord, on its way to ascend the Skjern Aa.

[2]) + indicates catch without information on weight quantity.

Year	The Nissum Fjord	The Storaa	The Ringkøbing Fjord	The Skjern Aa	The Varde Aa	The Sneum Aa	The Konge-aa	The Ribe Aa	The Brede Aa	The Vidaa
Carried forward										
1921.....	1,304	..	2,173	183	..	..	..	..	..	..
1922.....	1,735	..	2,534	172	..	..	..	..	..	..
1923.....	2,866	..	2,100	138	..	..	..	..	..	..
1924.....	2,761	..	1,475	240	500	668	75	50	..	..
1925.....	5,003	..	2,730	205	450	744	..	75	..	50
1926.....	2,489	..	1,159	300	500	122	125	100	..	55
1927.....	2,015	..	1,382	133	400	283	100	100	..	59
1928.....	2,306	..	1,244	150	347	333	75	..	..	40
1929.....	1,675	..	1,728	300	250	199	50	90	..	12
1930.....	3,747	..	868	192	300	45	50	70	..	56
1931.....	2,026	..	779	55	100	30	60	60	..	14
1932.....	1,563	..	832	51	100	40	120	70	..	35
1933.....	1,447	..	529	..	..	100	25	..	..	510
1934.....	1,249	..	1,017	..	+	+	+	+	..	267
1935.....	3,171	..	2,142	72	+	+	+	+	..	200
1936.....	7,830	..	2,863	..	194	20	75	..	+	309
1937.....	3,289	..	2,177	..	..	..	..	..	..	..
Total ...	96,297	..	72,243	..	..	..	..	..	..	..
Mean ...	2,603	..	1,953	..	..	..	..	..	..	..

Dansk Résumé.

Gennem nogle Aar har Biologisk Station fra forskellige Lystfiskere modtaget Skælprøver af Laks, som de selv eller andre har fanget i Skjern Aa; ogsaa af Laks, der er fanget med Garn i Storaaen i Fredningstiden for at skaffe befrugtede Æg til Klækning, er der indsendt Skælprøver ligesom af nogle enkelte fra Varde Aa og Sneum Aa. Ved en samlet Gennemgang viste der sig at være i alt 129 Prøver; herfra gaar imidlertid 4 Prøver, der kun indeholder et enkelt Skæl eller kun Erstatningsskæl; af Resten er de 107 fra Skjern Aa, 16 fra Storaaen, 1 fra Varde Aa og 1 fra Sneum Aa. Skønt Materialet langtfra er saa stort, som det kunde ønskes, synes der dog at være Grund til at offentliggøre det, da der ikke hidtil foreligger nogen tilfredsstillende Analyse af de vestjydske Laks[1]), og det har Interesse at se, om disse ikke i en eller anden Henseende har et Særpræg.

Afdøde Fiskeriinspektør, Magister Chr. Løfting rejste i 1928 Spørgsmaalet om, hvorvidt der findes en særlig vestjydsk Laksestamme, eller om de vestjydske Laks helt eller delvis er udenlandske Strejfere; han var tilbøjelig til at mene det sidste, fordi Laksefangsten i Vestjylland syntes nogenlunde upaavirket af de lokale Forhold (medens Ørredfangsten var gaaet tydeligt tilbage), og fordi der i Vestjylland kun fangedes faa eller ingen af de Laks, der kun har været eet Aar i Havet (A-Gruppen), og saadanne Laks udgjorde en stor Del af Fangsten i Gudenaaen.

Senere er det fastslaaet, at der finder nogen Lakseleg Sted i de vestjydske Aaløb, om end Omfanget er ret begrænset. Men ved Hjælp af de 125 Skælprøver er det nu forsøgt at skaffe yderligere Oplysninger om Bestanden.

Endnu ved vi intet paalideligt om Laksenes Vandringer i Vesterhavet; muligvis foregaar de regelmæssigt ligesom i Østersøen, muligvis er der overhovedet ikke saa udstrakte Vandringer; paafaldende er det, at der intet Steds i Vesterhavet eller de tilstødende Farvande har udviklet sig et regelmæssigt Fiskeri efter »Smaalaks« (altsaa under Laksens første Aar i Havet), saaledes som der har det i Østersøen. Der er siden 1927 udsat en hel Del Laks i Vestjylland; forhaabentlig vil man gennem Indsendelse af Meddelelser om Genfangster faa en Del nyttige Oplysninger. I alt er der udsat 1) 21 afstrøgne Legefisk mærket med Sølvsikkerhedsnaal, 2) 51 femaars Damlaks, de fleste mærket med Sølvsikkerhedsnaal, nogle med Dobbeltknap, 3) 712 eet- og toaars Damlaks og 203 udtrækkende Unglaks, nogle mærket som de ovennævnte, de fleste dog mærket med en Sølvtraad stukket igennem under Rygfinnens Forkant, snoet sammen og hyppigst forsynet med en kulørt Glasperle, og 4) c. 8,500 halvaars Laks, paa hvilke Fedtfinnen var svedet af. Paa Sikkerhedsnaalene og Dobbeltknapperne er der indslaaet Bogstaver og Numre, saa at de enkelte Fisk kan genkendes ved Genfangsten.

Af Skælprøverne fremgaar det, at Lakseungerne har opholdt sig fra 1—3 Aar i Fersk-

[1]) Tolkning af 46 af Skælprøverne er tidligere offentliggjort (3), men nogle af dem tolker jeg nu anderledes.

vand, før de trak ud i Havet (hyppigst 2 Aar, se Oversigt A Side 5). Udvandringsalderen i forskellige andre Vandløb er her anført til Sammenligning, og det ses heraf, at de vestjydske Laks ikke godt kan være vildfarne norske Laks, hvorimod der er god Overensstemmelse med f. Eks. Laksene fra River Tweed. Tilsvarende Analyser synes at mangle for tyske, hollandske og engelske Floder til Vesterhavet. Oversigt B (Side 6) viser de fundne Længder og deres Gennemsnitsværdi for udvandrende eetaars, toaars og treaars Unglaks.

I omtrent Halvdelen af Skællene iagttoges et Bælte af tætstillede Ringe inderst i første Havaars Tilvækstzone (Figur 1), medens et saadant Bælte manglede i de andre (Figur 2). Antagelig dannes dette Bælte (»Fjordzonen« = F i Tabel I) hos de Laks, der paa Vejen ud fra Ungdomsaarenes Vandløb stopper op i Brakvandsfjordene og bliver her nogle Maaneder med ikke stærkt foroget Vækshastighed, før de gaar ud i Havet, hvor Væksten tager Fart, hvilket afspejles i de vidtadskilte ringformede Lister paa Skællene. Er dette rigtigt, og er denne Dobbelthed i Udvandringsaarets Ring ikke almindelig i andre Laksebestande, vilde man her have noget for de vestjydske Laks ejendommeligt og et Tegn paa, at de paagældende Laks (altsaa c. Halvdelen af de undersøgte) er hjemmehørende her. Men formodentlig er den omtalte Dobbelthed i første Havring ret almindelig ogsaa andre Steder, saa at der ikke lader sig bygge synderligt paa denne Ejendommelighed.

De enkelte Laks er beskrevet i Tabel I, hvor hver af dem har faaet en Formel; Tallet før . angiver, hvor mange Aar Fisken har opholdt sig i Vandløbet, før den trak ud; Tallet efter . angiver Antallet af Aar, den har tilbragt i Havet (f. Eks. 2.3 = 2 Aar i Vandløb og 3 Aar i Havet). Har Laksen leget, er der dannet et «Gydemærke« i Skællene, og dette betegnes i Formlen med et G; har Laksen overstaaet Legen og tilbragt f. Eks. endnu en Vækstperiode i Havet, bliver dens Formel 2.3G1, og viser Skællene, at den er inde i en endnu ikke afsluttet Vækstperiode, tilføjes der et +.

Af Aarringene i Skællene kan den paagældende Fisks Længde ved Afslutningen af de forskellige Vækstperioder udregnes; for Laksene gælder det dog kun dem, der ikke har noget Gydemærke. I Tabel II er det gjort for Skjern Aa-Laksenes vedkommende; l_1, l_2 og l_3 betyder Længden ved Afslutningen af første, anden og tredje Ferskvands-Vækstperiode, medens L_1, L_2, L_3 og L_4 betyder de tilsvarende Længder for Hav-Vækstperioderne. Resultaterne er samlet i Oversigt C Side 7, og de viser sig at stemme ret nøje overens for de 10 Hanner, de 13 Hunner og de 27, hvis Kon ikke var opgivet. En blank Opgangslaks af A-Gruppen vil gennemsnitlig maale godt 50 cm, medens de af B-, C- og D-Gruppen gennemsnitlig vil maale godt 81 cm, 96 cm og 109 cm.

Hvor længe det varer, inden Laksen gaar op for at lege første Gang, ses af de to Oversigter D og E (Side 7 og 8) over de 107 Laks fra Skjern Aa og alle de 125 Laks. De fleste bliver 3 Aar i Havet, inden de gaar op første Gang; rundt regnet er det de 64 %, medens 23 % kun bliver 2 Aar og 12 % udstrækker Havopholdet til 4 Aar — og endelig nogle faa gaar op efter eet Aars Forløb (men disse sidste er ikke direkte iagttaget, kun udregnet efter Skælprøver af Laks, der har overstaaet deres første Leg, der maaske ikke fandt Sted i Vestjylland).

Oversigt H (Side 9) viser, i hvilke Maaneder de første Gang opstigende Blanklaks er taget; det ses, at A-Gruppen (eet Aars Ophold i Havet) mangler helt, at C-Gruppen (tre Aars Havophold) er den almindeligste, medens B- og D-Grupperne (henholdsvis 2 og 4 Aars Havophold) forekommer noget mindre hyppigt.

Oversigt F (Side 8) viser, at Gennemsnitslængden og -vægten af Opgangslaksene under eet er stigende fra Februar til Maj, men Regelmæssigheden udviskes noget, naar C- og D-Grupperne undersøges hver for sig (Oversigt G, Side 9), snarest dog, fordi Materialet bliver for lille.

De vestjydske Opgangslaks er godt i Stand. Man udregner Ernæringskoefficienten (k) af Ligningen: Vægten i Gram × 100 = Længden i tredje Potens × k, og Værdien af k fremgaar af Oversigt I (Side 10); den er gennemsnitlig 1,04—1,05. Sammenligner man med Ernæringstilstanden hos de nu forsvundne Gudenaa-Laks og hos de bornholmske, kommer man til det Resultat, at de vestjydske Laks ikke staar tilbage for, snarere er bedre end Gudenaa-Laksene, og disse igen syntes bedre end Laks taget i Havet ved Bornholm. Dog spiller det en Rolle ved disse Beregninger, med hvor stor Nøjagtighed Længde og Vægt er opgivet.

Antallet af Laks, der har leget før, er undersøgt. Af de 125 blev 114 (muligvis 116) fanget paa Vejen til eller fra deres første Leg; 9 (muligvis 11) havde leget før. Det er ikke noget stort Antal (7—9 %); men det betyder ingenlunde, at det er imod Laksens Natur at yngle mere end een Gang, saaledes som man tidligere opfattede det, hvilket bl. a. gav sig Udtryk i, at den datidige Fredning af Nedfaldslaks under 523 mm blev ophævet ved Ferskvandsfiskeriloven af 1917. At de udlegede Laks ofte er levedygtige, fremgaar jo allerede deraf, at der mellem disse 125 Laks var ikke mindre end 6 Hanner, 8 Hunner og 25 af ubestemt Køn (i alt 39), der blev taget efter Legen af Lystfiskere, og som altsaa har været kry nok til at søge Næring. Var de ikke blevet fanget, vilde de fleste af dem antagelig have kunnet klare sig til Havs. I de nuværende Laksebestande er det som bekendt sjældent at træffe Laks, der har ynglet mere end 2 Gange og er kommet godt fra det; Järvi & Menzies nævner dog een, der har leget 4 Gange, og Biologisk Station har Skælprøve af en Laks, der har leget 3 Gange og er taget som blank i Havet ved Bornholm (3. Maj 1921, 23,5 kg, 3.2G1G2G1+); men sligt er nutildags Undtagelser. Derimod kan de i Dam opdrættede Laks afstryges Aar efter Aar uden synderlig Dødelighed de første Gange. Det forekommer mig givet, at meget vilde kunne opnaas for Laksebestandene, i hvert Fald i vore roligt flydende Vandløb, der ikke byder de af Legen svækkede Laks saa store Vanskeligheder, hvis Nedfaldslaksene fik Fred til at komme til Havs; den Usikkerhed, der opstaar ved, at Blanklaks og Nedfaldslaks i visse Tilfælde kan forveksles, og ved, at man i hvert Fald ikke kan forhindre Nedfaldslaksene i at gaa paa Krogen, naar der fiskes efter Blanklaks, kunde man komme udenom ved at frede saavel Nedfaldslaksen som den blanke Laks (samt Ørreden) et Stykke ud over den nuværende Fredningstid, der jo kun omfatter de to Maaneder November og December, helst yderligere tre Maaneder[1]). Saafremt Nedfaldslaksene ikke trækker ud af Aaerne før i Løbet af Marts, vilde det dog næppe gavne tilstrækkeligt at frede dem i Januar og Februar, da de saa rimeligvis vilde blive fanget i Marts. De i Skjern Aa i Aarets første Halvdel fangede Nedfaldslaks, af hvilke Skælprøver foreligger, fordelte sig saaledes paa de enkelte Maaneder:

Maaned	Januar	Februar	Marts	April	Maj	Juni
Antal Nedfaldslaks	4	12	14	4	1	0

Da det viser sig (Oversigt K, Side 11), at de 125 Laks er gaaet op gennemsnitlig c. 6 Aar efter, at deres Forældre gik op, skulde man vente, at der 6 Aar efter et Aar med stærk Opgang (rigt Fiskeri) vilde følge et nyt godt Lakseaar; men saadan er det egentlig ikke i Vestjylland. Fig. 3 viser Fangsten i Ringkjøbing Fjord og Nissum Fjord i de 37 Aar fra 1901 til 1937; den har været meget uregelmæssig, men i Hovedsagen har Fiskeriet svinget ensartet i de to Fjorde. Det synes ikke muligt at finde nogen fast Rytme i Kurverne, selv om der jævnlig er 5 eller 6 Aar mellem Kurvetoppene. Og en paafaldende Uregelmæssighed frembyder Aarene 1919—1920,

[1]) I Fiskeriregulativet for den nedre Del af Skjern Aa er fastsat en Fredningstid fra den 15. Oktober til den 1. Marts. Fiskeriforeningen for Holstebro og Omegn holder en lignende Fredningstid i Storaaen.

som i Stedet for den Kurvetop, man skulde vente, har et dybt Fald; for Nissum Fjords vedkommende er det muligt, at dette kan skyldes særlig vanskelige Udstromningsforhold ved Thorsminde i disse Aar, men noget saadant skulde ikke kunne gælde Ringkjobing Fjord. Det synes derfor, som om Bestanden — tværtimod hvad man skulde vente — har været ringe i disse Aar; eller er den søgt andre Steder hen for at yngle? Dette tyder i Virkeligheden i høj Grad paa, at det drejer sig om Laks, der ikke er lagt til i de vestjydske Vandløb.

At der har kunnet ske en Forskydning af Opgangen fra Nissum Fjord til Ringkjobing Fjord, naar Adgangen til den første hindredes ved Tilsanding, er troligt (saaledes maaske i 1907 og 1922).

Saafremt Svingningerne i Laksefangsten i de vestjydske Fjorde var betinget af Forhold som lettere eller vanskeligere Opgangsforhold de enkelte Aar (Vandføringen, Afspærringer) eller af mere eller mindre intensivt Fiskeri, vilde der være Grund til at vente tilsvarende Svingninger i Kurven for Orredfangsten, selv om Orredens Opgang falder senere paa Aaret. Kurven over Orredfangsten i de to vestjydske Fjorde (Fig. 4) viser imidlertid ingen Lighedspunkter med Laksekurven. For 1910 var Orredfangsten tilsyneladende ikke meget forskellig fra nu, maaske lidt bedre; men i Perioden 1910—1916 var Orredfiskeriet derimod væsentlig bedre i Ringkjobing Fjord, hvilket utvivlsomt staar i Forbindelse med de i Fjorden ved Hvide Sande Kanalens Aabning i 1910 ændrede Forhold. Fra 1917 fulgte en Række Aar med ret smaa Fangster (under 2000 kg) og med ret smaa Udsving, hvorpaa Udbyttet i de senere Aar atter synes noget stigende. Der er Grund til at bemærke, at der ikke (som for Laksens vedkommende) var noget udpræget Minimum for Fangsten i 1920.

Gennemsnitsvægten af Blanklaksene fra Skjern Aa var 9,52 kg. Herefter kan Antallet af de i Fjordene fangede Laks nogenlunde beregnes, selv om der sikkert ogsaa i Fjordfangsterne har været adskillige Nedfaldslaks med ringere Vægt imellem, dog næppe forholdsvis saa mange som oppe i Aaerne. Til den gennemsnitlige Fangst af 1953 kg Laks i Ringkjobing Fjord maa svare mindst 205 Stykker; formodentlig skulde der saa til den gennemsnitlige Fangst af 2603 kg Laks i Nissum Fjord svare mindst 273 Stykker. Er det her hjemmehørende Laksebestande, der kommer til Fangst i disse Fjorde og i Vandløbene indenfor, er de altsaa saa faatallige, at de meget let vil kunne komme ud for lignende Krise, som den, der udryddede Gudenaa-Bestanden. Men er det overvejende fremmede Bestande, der sender Strejfere til Vestkysten, vil Fangsten her hovedsagelig afhænge af Bestandenes Trivsel i deres Hjemland.

I Figur 5 sammenlignes de vestjydske Laksefangster (B) med de østengelske (A) og med dem fra Gudenaaen og Randers Fjord (C); nogen Overensstemmelse udover det dybe Minimum i 1920 synes ikke at foreligge. I Østengland — men ikke i Vestjylland — efterfølges det af Minima 5 og 10 Aar efter. I Gudenaaen uddøde Laksene, navnlig som Følge af Anlægget af Kraftstationen ved Tange i 1920, ret snart efter.

Nogen sikker Afgørelse af Spørgsmaalet, om de vestjydske Laks danner en egen Bestand, eller om de i større eller mindre Omfang rekruteres andet Steds fra, har her ikke kunnet gives. Men Spørgsmaalet er stillet og vil antagelig kunne besvares ad Aare, naar Skælmaterialet er øget og Statistikken blevet fyldigere; ogsaa gennem Mærkninger er der Haab om, at Spørgsmaalet kan blive belyst. – Sandsynligt er det, at Lakseopgangen i de vestjydske Aalob sammensættes dels af hjemlige, dels af fremmede Laks. Disse sidste er maaske Individer, der er kommet bort fra den paagældende Stammes normale Trækveje; maaske hidrører de fra mange

[1]) I Udlandet mærkede Laks er hidtil ikke taget ved den jydske Vestkyst. Derimod blev en i River Tweed i Januar 1929 mærket Havørred genfanget samme Aar ud for Husby Klit.

forskellige Stammer, muligvis hovedsagelig fra een eller nogle faa[1]). Det kunde tænkes, at den jævnligt forekommende høje Alder hos Opgangsfiskene (D-Gruppen = —.4) stod i Forbindelse med, at de paagældende Laks var vildfarne.

Bestaar Opgangen for en skiftende, men jævnlig betydelig Dels vedkommende af saadanne fremmede Laks, er det ikke at undres over, om der ikke bliver synderlig Regelmæssighed i Fangstkurvernes Forløb, i Fordelingen af Maxima og Minima — disse vilde da for en stor Del være afhængige af de Faktorer, der leder Laksenes Gang ude i Havet.

Literature.

1. Alm, Gunnar: "Der Lachs (Salmo salar L.) und die Lachszucht in verschiedenen Ländern." (Archiv für Hydrobiologie. XIX, 1928).
2. — "Salmon in the Baltic Precincts." (Cons. perm. internat. p. l'explor. de la mer. Rapp. et Proc.-verb. XCII, 1934).
3. Blegvad, H.: "Om Fiskene i Ringkøbing Fjord 1913—32." (A. C. Johansen †, H. Blegvad & R. Spärck: "Ringkøbing Fjords Naturhistorie i Brakvandsperioden 1915—31." Copenhagen, 1933—36).
4. Chimits, Pierre: "Remarques sur le saumon de l'Ardour." (Bulletin français de pisciculture, no. 99, septembre 1936).
5. Dahl, Knut: "Laks og Laksefiske." Oslo, 1929.
6. Dahl, Knut, og Sven Sømme: "Experiments in Salmon Marking in Norway 1935." (Skr. utgitt av Det Norske Videnskaps-Akademi i Oslo. I. Mat.-nat. Klasse. 1935, No. 12. Oslo, 1936).
7. — — "Salmon Markings in Norway 1936." (Skr. utgitt av Det Norske Videnskaps-Akademi i Oslo. I. Mat.-nat. Klasse. 1936, No. 1. Oslo 1937).
8. Fritsch, Ant.: "Der Elblachs." Prag, 1893.
9. Henking, H.: "Untersuchungen an Salmoniden. I—II." (Conseil perm. internat. p. l'explor. de la mer. Rapp. et Proc.-verb. LXI, 1929 et LXXIII, 1931).
10. Järvi, T. H., and W. J. M. Menzies: "The Interpretation of the Zones on Scales of Salmon, Sea Trout and Brown Trout." (Cons. perm. internat. p. l'explor. de la mer. Rapp. et Proc.-verb. XCVII, 1936).
11. Järvi, T. H.: "Fluctuations in the Baltic Stock of Salmon (1921—1935)." (Cons. perm. internat. p. l'explor. de la mer. Rapp. et Proc.-verb. CVI, 1938).
12. Johansen, A. C., und J. Chr. Løfting: "Über den Gudenaa-Lachs." (In H. Henking: "Die Lachsfrage im Ostseegebiet." II. Conseil perm. internat. p. l'explor. de la mer. Rapp. et Proc.-verb. XXIII, 1916).
13. — — "Om Fiskebestanden og Fiskeriet i Gudenaaens nedre Løb og Randers Fjord." I. Copenhagen, 1919.
14. Løfting, Chr.: "Findes der ikke mere danske Laksestammer?" (Ferskvandsfiskeribladet, 1928, Nr. 12).
15. Macfarlane, P. R. C.: "Salmon of the River Tweed." (Fisheries, Scotland, Salmon Fish 1932, III and 1933, III).
16. Menzies, W. J. M., and P. R. C. Macfarlane: "Salmon of the River Dee (Aberdeenshire)". (Fisheries, Scotland, Salmon Fish 1926, IV, 1927, III and 1931, IV).
17. — — "Salmon of the River Spey." (Fisheries, Scotland, Salmon Fish 1926, V, 1928, I and 1928, III).
18. Otterstrøm, C. V.: "Fisk II. Blødfinnefisk". Danmarks Fauna Nr. 15. Copenhagen, 1914.
19. — "Reife Lachse (Salmo salar) in Teichen." (Journal du Conseil internat. p. l'explor. de la mer. VIII, 1933).
20. — "Dør Laksen efter første Leg?" (Ferskvandsfiskeribladet, 1934, Nr. 3).
21. — "Vestjydske Mærkninger af Laks og Ørred." (Ferskvandsfiskeribladet, 1938, Nr. 8). Copies with English Summary.
22. Poulsen, Erik M.: "Recent Investigations into the Stock of Salmon and Sea Trout in the River Gudenaa." (Rep. Dan. Biol. Stat., XL, 1935).
23. Segerstråle, Curt: "Studier rörande havsforellen (Salmo trutta L.) i södra Finland, speciellt på Karelska näset och i Nyland." (Acta Soc. pro Fauna et Flora Fennica. 60, 1937).
24. Fiskeri-Beretning for Finansaaret 1900—1901... and following years (from 1908: Fiskeri-Beretning for Aaret 19..). Copenhagen.
25. Ministry of Agriculture and Fisheries. Fisheries—England and Wales. Salmon and Freshwater Fisheries. Reports for the years 1925—1935. London.

Nr. 6 A. C. Strubberg: Marking Experiments with Plaice and Lemon Soles at the Færoes in 1910—12. 28 Fig. 1918. 64 p. Kr. 2.25.

» 7 Johs. Schmidt: Stations in the Atlantic, etc. 1911—15. With two Charts and introductory remarks. 1919. 27 p. Kr. 1.50.

» 8 A. C. Johansen: On the large spring-spawning Sea Herring (Clupea harengus L.) in the northwest European waters. 14 Fig. 1919. 56 p. Kr. 1.75.

» 9 A. C. Johansen and Kirstine Smith: Investigations as to the effect of the restriction on fishing during the war on the plaice of the eastern North Sea. 10 Fig. 1919. 53 p. Kr. 1.75.

Bind VI.

» 1 P. Jespersen: On the occurrence of the postlarval stages of the Herring and the »Lodde« (Clupea harengus L., and Mallotus villosus O. F. M.) at Iceland and the Færoes. 1920. 10 Fig. 24 p. Kr. 1.25.

» 2 Kirstine Smith: Danish Investigations of Plaice from the North Sea July 1919—July 1920. 1921. 2 Fig. 68 p. Kr. 4.75.

» 3 A. C. Johansen: On the Summer-spawning Herring (Clupea harengus L.) of Iceland. 1921. 4 Fig. 40 p.

» 4 A. C. Johansen: The Atlanto-Scandian Spring Herring spawning at the Faroes 1921. 11 p. Kr. 3.75.

» 5 J. P. Jacobsen and A. C. Johansen: On the Causes of the Fluctuations in the Yield of some of our Fisheries. I. The Salmon and Sea Trout Fisheries. 1921. 11 Fig. 18 Tab. 48 p. Kr. 3.50.

» 6 Johs. Schmidt: Contributions to the Knowledge of the Young of the Sun-Fishes (*Mola* and *Ranzania*). 1921. 1 Pl. 15 Fig. 13 p. Kr. 1.50.

» 7 Erik M. Poulsen: On the Frequency and Distribution of *Crangon vulgaris*, *Carcinus mœnas* and *Portunus holsatus* in the Danish coastal waters. 1922. 4 Fig. 2 Tab. 18 p. Kr 1.65.

» 8 A. C. Johansen: On the Density of the Young Plaice Population in the eastern part of the North Sea and the Skagerak in pre war and in post war years. 1922. 10 Fig. 10 Tab. 31 p. Kr. 2.50.

» 9 J. P. Jacobsen and A. C. Johansen: On the Causes of the Fluctuations in the Yield of some of our Fisheries. II. The Eel Fisheries. 1922. 20 Fig. 6 Tab. 32 p. Kr. 2.75.

Bind VII.

» 1 A. C. Strubberg: Marking Experiments with Cod (Gadus callarias L.) in Danish Waters, 1905—1913. 1922. 17 Fig. 27 Tab. 60 p. Kr. 4.25.

Nr. 2 Kirstine Smith: Investigations of Plaice from the Western Baltic June 1921—August 1922. 1923. 6 Fig. 14 Tab. 48 p. Kr, 3.50.

» 3 Bjarni Sæmundsson: On the Age and Growth of the Cod (Gadus callarius L.) in Icelandic Waters. 1923. 8 Fig. 35 p. Kr. 2.75.

» 4 Kirstine Smith: On the Plaice Population of the Horns Reef Area in the Autumn of 1922 1923. 14 Fig. 78 p. Kr. 5.50.

» 5 A. C. Johansen: On the Summer- and Autumn-Spawning Herrings of the North Sea. 1924. 15 Fig. 119 p. Kr. 8.00.

» 6 P. L. Kramp: Fish eggs and larvæ collected in the Belt Sea in March 1922. 1924. Kr. 1.75.

» 7 Ad. S. Jensen: On the Fishery of the Greenlanders. 1925. 31 Fig. 1 Chart. 38 p. Kr. 3.00.

» 8 A. C. Johansen: On the Influence of the Currents upon the Frequency of the Mackerel in the Kattegat and adjacent parts of the Skagerak. 1925. 15 Fig. 26 p. Kr. 2.25.

Bind VIII.

» 1 Bjarni Sæmundsson: On the age and growth of the Haddock (Gadus æglefinus L.) and the Whiting (Gadus merlangus L.) in Icelandic waters. 1925. 8 Fig. 33 p. Kr. 2.65.

» 2 A. C. Johansen: On the diurnal vertical Movements of Young of some Fishes in Danish Waters. 1925. 11 Fig. 28 p. Kr. 2.25.

» 3 Martin Knudsen: A Bottom Sampler for hard Bottom. 1927. 2 Fig. 4 p.

» 4 A. C. Johansen: Preliminary Experiments with Knudsen's Bottom Sampler for hard Bottom. 1927. 3 Tab. 6 p. Kr. 1 25.

» 5 Anton Fr. Bruun: Quantitative investigations of the 0-group and I-group of the Plaice, Turbot, Brill and Sole in the Skagerak, Kattegat and Belt Sea. 1927. 6 Fig. 30 p. Kr. 2.50.

» 6 Aage J. C. Jensen: An Investigation of the Stock of Plaice in the Southern Horns Reef Area in the Years 1925 and 1927. 1928. 13 Fig. 44 Tab. 63 p. Kr. 4.50.

» 7 Bjarni Sæmundsson: On the Age and Growth of the Coalfish (Gadus virens L.), the Norway Pout (Gadus Esmarki Nilsson) and the Poutassou (Gadus poutassou Risso) in Icelandic waters. 1929. 7 Fig. 37 p. Kr. 3.65.

» 8 Aage J. C. Jensen: On the Influence of the Size of the Stock of Cod upon the yield of the Herring Fishery in the Kattegat, Belt Sea, and Western part of the Baltic, and some other causes of variations in the Cod and Herring Fisheries. 1929. 3 Fig. 2 Tab. 16 p. Kr. 1.50.

The name »Kommissionen for Havundersøgelser« has from the 1st of September 1926 been changed to: »Kommissionen for Danmarks Fiskeri- og Havundersøgelser«.

MEDDELELSER FRA
KOMMISSIONEN FOR DANMARKS FISKERI- OG HAVUNDERSØGELSER

Serie: Fiskeri.

Bind IX.

Nr. 1 Erik M. Poulsen: Biological Investigations upon the Cod in Danish Waters. 1931. 43 Fig. 29 Tab. 148 p. Kr. 10.00.

» 2 Aage J. C. Jensen: Investigations of the Plaice Stock in the southern Horns Reef Area in the years 1928—30. 1931. 7 Fig. 16 + 15 Tab. 32 p. Kr. 2.50.

» 3 Å. Vedel Tåning: Fluctuations in the Stock of Cod in Icelandic Waters. 1931. 13 Fig. 34 + 4 Tab. 43 p. Kr. 3.15.

Nr. 4 Erik M. Poulsen: On the spawning places of the herring in certain parts of the North Sea, the Skagerak, and the Kattegat in the autumn of 1930 and some earlier years. 1932. 10 Fig. 2 Tab. 17 p. Kr. 1.65.

» 5 Aage J. C. Jensen: Periodic Fluctuations in the Size of Various Stocks of Fish and their Causes. 1933. 21 Fig. 28 Tab. 70 p. Kr. 5.00.

Nr. 6 ANTON FR. BRUUN and BØRGE HEIBERG: The "Red Disease" of the Eel in Danish Waters. 1932. 1 Fig. 1 Tab. 20 p. Kr. 1.65.

» 7 A. C. STRUBBERG: Marking Experiments with Cod at the Faroes. II. Second Report. Experiments in 1923—1927. 1933. 13 Fig. 18 Tab. 36 p. Kr. 3.00.

Bind X.

» 1 PAUL M. HANSEN, AD. S. JENSEN & Å. VEDEL TÅNING: Cod Marking Experiments in the Waters of Greenland 1924—1933. 1935. 41 Fig. 74 Tab. 119 p. Kr. 6.40.

Nr. 2 H. M. THAMDRUP: Beiträge zur Ökologie der Wattenfauna auf Experimenteller Grundlage. 1935. 125 Fig. 13 Tab. 125 p. Kr. 5.60.

» 3 Å. VEDEL TÅNING: Young Herring and Sprat in Faroese Waters. 1936. 11 Fig. 15 Tab. 28 p. Kr. 1.20.

» 4 Å. VEDEL TÅNING; On the Eggs and Young Stages of the Halibut. 1936. 8 Fig. 8 Tab. 23 p. Kr. 1.00.

» 5 P. JESPERSEN: Statistical Survey of the Halibut fishery in the Waters round the Faroes, Iceland and Greenland. 1938. 20 Fig. 27 Tab. 37 p. Kr. 1.20.

» 6 C. V. OTTERSTRØM: 125 Salmon from West Jutland. 1938. 5 Fig. 3 Tab. 26 p. Kr. 1.25.

As and from Bind X the size of the publication has been altered.

Serie: Plankton
„ : Hydrografi } see cover of these publications.

SKRIFTER UDGIVNE AF KOMMISSIONEN

Nr. 1 JOHS. SCHMIDT: Fiskeriundersøgelser ved Island og Færøerne i Sommeren 1903. 10 Tavler. 1904. VI + 148 S. Kr. 5.00. Udsolgt.

» 2 MARTIN KNUDSEN: Havets Naturlære. Hydrografi. Med særligt Hensyn til de danske Farvande. 10 Figurer, 4 Tavler. 1905. 41 S. Kr. 1.75. Udsolgt.

» 3 JOHAN HJORT og C. G. JOH. PETERSEN: Kort Oversigt over de internationale Fiskeriundersøgelsers Resultater med særligt Henblik paa norske og danske Forhold. 10 Tavler. 1905. 54 S. Kr. 3.50.

» 4 MARTIN KNUDSEN, C. G. JOH. PETERSEN, C. F. DRECHSEL, C. H. OSTENFELD: De internationale Havundersøgelser 1902—07. 1908. 28 S. Kr. 0.75.

» 5 BJARNI SÆMUNDSSON: Oversigt over Islands Fiske med Oplysning om deres Forekomst, vigtigste biologiske Forhold og økonomiske Betydning. 1 Kort. 1909. 140 S. Kr. 2.25.

Nr. 6 ANDREAS OTTERSTRØM: Sildens Afhængighed af forskellige hydrografiske og meteorologiske Forhold i Store Bælt. 2 Textfigurer. 1910. 52 S. Kr. 1.00.

» 7 A. C. JOHANSEN: Om Rødspætten og Rødspættefiskeriet i Beltfarvandet med nogle Bemærkninger om de øvrige Flynderarter og Flynderfiskerier i samme Farvand. 23 Tavler, 14 Textfigurer. 1912. 158 Sider. Kr. 3.00.

» 8 JOHS. SCHMIDT: Danske Undersøgelser i Atlanterhavet og Middelhavet over Ferskvandsaalens Biologi. 3 Tavler, 5 Textfigurer. 1912. 33 Sider. Kr. 1.50.

» 9 A. C. JOHANSEN og J. CHR. LØFTING: Om Fiskebestanden og Fiskeriet i Gudenaaens nedre Løb og Randers Fjord. — With an English Resumè. 4 Tavler. 42 Textfigurer. 1919. 169 Sider. Kr. 3.75.

» 10 ERIK M. POULSEN: Om Hummeren og Hummerfiskeriet i de danske Farvande. 6 Textfigurer. 1927. 42 Sider. Kr. 1.00.

Notice:

It is requested that notice of any error in address or other communications concerning mailing etc. of this publication is sent to: Marinbiologisk Laboratorium, Charlottenlund Slot, Charlottenlund.

A complete list of the subjects included in the finished volumes will be furnished on application.